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ABSTRACT: The 2015 Eisenhower School Aircraft Industry Seminar conducted an assessment of military aircraft exports in international markets. Analyzing international defense markets generally indicate foreign security and economic priorities and can provide insight into technology regimes and military balances. This study seeks to characterize the military aircraft industry by market segment for fighter aircraft, unmanned aerial vehicles (UAVs) and rotorcraft. Each market segment was evaluated based on the following regional breakdown: Asia-Pacific, Middle East/North Africa, Europe, Western Hemisphere, Commonwealth of Independent States (CIS) and Sub-Saharan Africa. Within each region, the seminar considered opportunities for US firms through understanding the regional security dynamics, the budgetary and economic environment, policy considerations and industrial dynamics. The seminar considered maintenance, repair and overhaul (MRO) opportunities within business strategy and procurement opportunities. Each region assessed provided various opportunities and challenges for market opportunities in each of the market segments. This study seeks to diagnose implications for these regional market opportunities for both US firms and the US government. For US firms, the health of the US defense industrial base and firm export strategies were deemed critical to maintain a competitive business advantage for near term and long-term viability. For the US government, exports were assessed to have a direct impact to US interests domestically and overseas.

Col Zdenek Bauer, Czech Air Force
CDR Christopher Cox, US Navy
Mr. Brian Dodson, National Geospatial- Intelligence Agency
LtCol Justin Eggstaff, US Marine Corps
COL William Fuller, French DGA
COL Bryan Hoff, US Army
COL Jay Klaus, US Army
CDR Bobby Markovich, US Navy
Dr. William Mea, Office of Management and Budget
Ms. Karen Pound, Dept. of the Air Force
Lt Col Mark Reents, US Air Force
Lt Col Jason Rusco, US Air Force
LtCol Douglas Sanders, US Marine Corps
Ms. Kathy Trimble, Defense Intelligence Agency

Dr. Sorin Lungu, Faculty Lead
CAPT Thomas Slais, US Navy, Faculty

PLACES VISITED

Domestic:
Boeing, St. Louis, MO
Lockheed Martin, Fort Worth, TX
Sikorsky Aircraft Corporation, Stratford, CT
Boeing Rotorcraft Systems, Ridley Park, PA
Bell Helicopter, Amarillo, TX
Moog Inc., Blacksburg, VA

International:
SaaB AB Corporate HQ, Bromma, Sweden
Corporate Headquarters SaaB Aeronautics, Linkoping, Sweden
Stockholm International Peace Research Institute (SIPRI), Solna, Sweden
Swedish Defence Research Agency (FOI), Stockholm, Sweden

INTRODUCTION

Thesis

The relative downturn in US defense budgets and military aircraft procurement over the next 5 – 10 years is causing US aerospace and defense firms to consider exports as key components of their business strategies and competitive positioning. Changing US and international defense priorities remain drivers of market opportunities. For US firms and the government, international market opportunities shape economic and security interdependencies. US firms tend to consider international business opportunities as an alternative or a hedging strategy in order to sustain their defense industrial base. In order to maintain the health of the industrial base and their competitive advantage, international sales opportunities are viewed as a means to sustain their production facilities, human capital and supplier/partner relationships.

However, in assessing security, economic and regulatory dynamics across international markets, US firms may find challenges in executing current business models. Requirements for fighters, UAVs and rotorcraft vary by region and procurement and lifecycle costs are major considerations. In this regard, US firms face an additional challenge of price for these systems. Additionally, if firms begin to focus on international markets and exports, business models would potentially change and therefore create additional tensions for firms to balance domestic, international and possibly commercial portfolios. For the US government, the potential shifting defense industrial base business models may impact US national security needs with respect to capacity, human capital and technological dominance. Moreover, the export of technologies may impact international competition and regional military balances. Over the long term, US planning and postures could be altered due to technology diffusion.

Research Methodology and Limitations

International markets are defined as those countries and regions external to the United States. Therefore, no US market opportunities were assessed. Market segments are defined by platforms and do not consider sub-systems, payloads or engines. Assessment criteria and methodology are detailed in the chart below. Research for this assessment was from December 2014 – March 2015. Research material included open-source data, market research reports and international trade and business case studies. In addition, this assessment included domestic and international industry site visits. The overall classification of this study is unclassified and does not consider classified or proprietary information.

Disclaimer

The views expressed in this paper are those of the seminar members (students and faculty) and do not reflect the official policy or position of the National Defense University, the Department of Defense or the U.S. Government.

REGIONAL SECURITY OVERVIEW

Asia Pacific

Over the next decade, the Asia Pacific (AP) region is envisaged to become a region of economic growth with increasing regional security requirements. This region is of vital US economic, diplomatic and security interests due to the interdependencies linked with trade, treaty obligations and partner relationships. The Asia Pacific region is a compilation of three sub-regions that may impact overall military and economic balances. South Asia, with growing economic and energy needs, is considered a growing market for military aircraft. Southeast Asian markets are largely driven by security requirements due, in part, to multiple territorial claims. Northeast Asia continues to wrangle with North Korean military activities and US and South Korean forces present on the peninsula.

There are several significant regional drivers for aircraft procurement. The Asia Pacific region is largely reliant on the maritime environment to sustain and project its economic power as well as operate militarily. With the current maritime exclusive economic zones (EEZs) and territorial disputes for extraction and fisheries rights, access to the maritime domain for global commerce can be significantly effected should a military conflict erupt. Another driver of aircraft procurement is modernization. Overall, the majority of AP armed forces possess aged aircraft inventories. Case in point, the Philippine Air Force combat aircraft inventory comprises of only six OV-10A Broncos that were built during the Vietnam War.[1] Likewise, Taiwan possess 54 UH-1H Iroquois manufactured in 1969.[2] These examples illustrate aviation challenges and are

endemic in these countries land and sea based inventories as well. These aging inventories place tension on a nation's ability to operate and effectively execute military operations. Additionally, modernization for these countries creates a prioritization issue in that countries must balance their air, land and sea based capabilities portfolios. While economic growth is projected to increase, most countries defense budgets cannot absorb multiple modernization efforts at any one time.

Asia Pacific countries are investing in fighter/attack (F/A) aircraft to counter the growing perceived threats as well as efforts to maintain parity with other Western Pacific countries. Multirole F/A aircraft are useful for a variety of missions in this expansive region. These include traditional combat roles such as offensive and defensive counter-air, close air support, interdiction, and deep strike. Fighter aircraft can also be used for peacetime operational missions including: border enforcement, intelligence, surveillance, and reconnaissance (ISR), counter narcotics, coastal and maritime patrols, protection of sovereign territorial waters and economic exclusion zones as well as counter insurgencies and counter terrorism efforts.

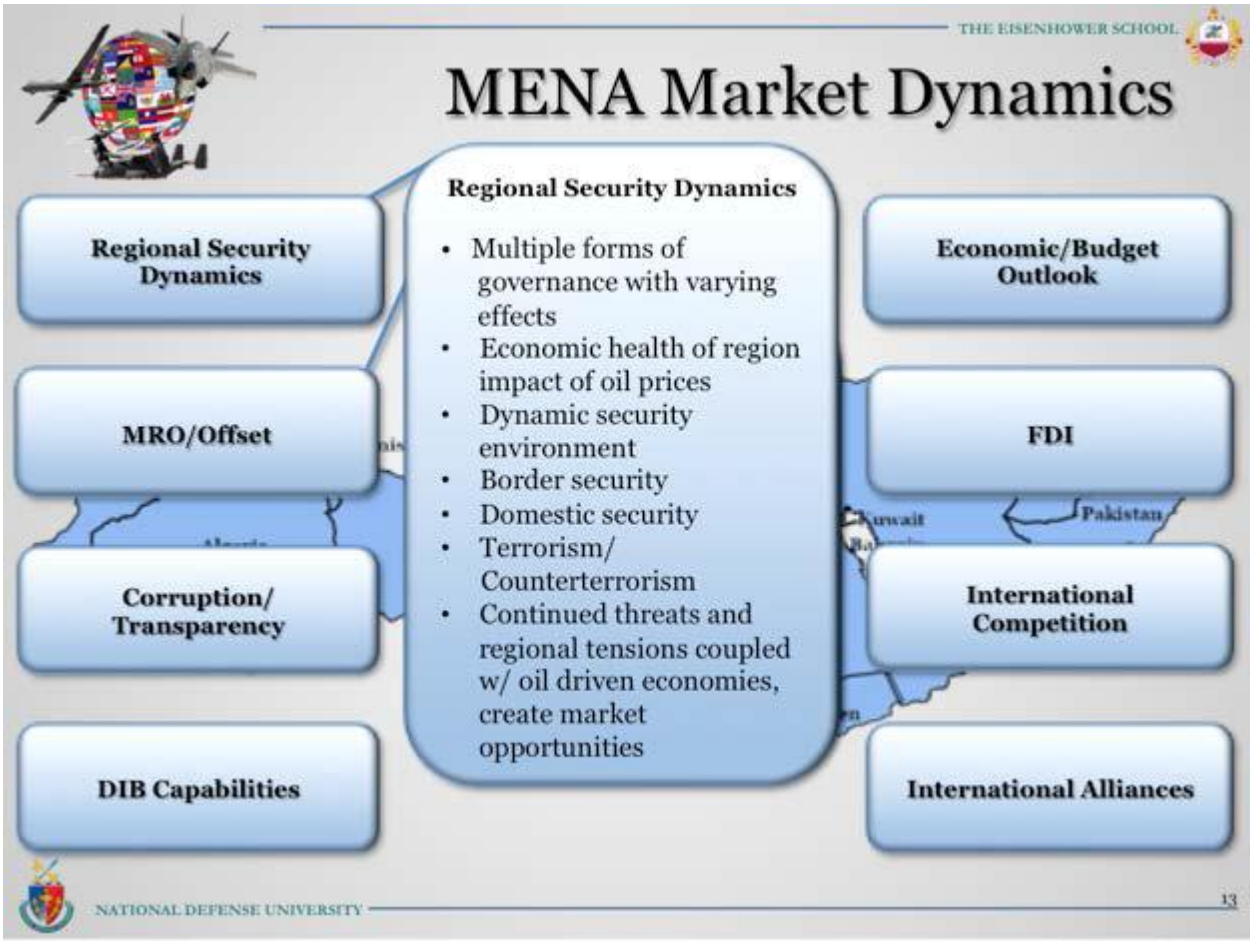
Countries want to either upgrade existing fleets or procure new multi-role fighters to meet most if not all of the mission areas listed above on a single, moderately priced, scalable, open architecture platform with future growth potential. Operating and lifecycle cost are becoming a more important factor in fighter procurement decisions. OEMs need to design and build long-term cost efficiencies into their multirole platforms from the beginning to remain competitive in the global markets.

The political and military environments necessitate two major rotary-wing mission-sets. For offensive air support, there are reconnaissance and strike capabilities. Indonesia and the Philippines, for example, need attack helicopters in support of counterterrorism missions. Japan and the Republic of Korea (ROK) use rotary-wing offensive air to deter aggression. Assault support is the other rotary-wing mission-set. It incorporates five key subsets: troop transport, humanitarian assistance/disaster relief (HA/DR), medical evacuation, and logistical resupply.

There are two major mission areas that are driving procurement of UAVs in the Asia Pacific region. Land forces desire small and tactical UAV systems for organic ISR for ground unit situational awareness to be able to go beyond line of sight. The main demand signal for these types of systems is in India and Vietnam. Other countries are also interested in these systems in support of internal domestic security concerns to counter existing or potential insurgent movements.

The second type of UAV in demand is Medium or High Altitude Long Endurance (MALE/HALE) UAVs for the international maritime environment. Those countries with maritime disputes in the South China Sea (Philippines, Vietnam, Malaysia, Indonesia, and Singapore) and whose trade depends on freedom of navigation of trade routes (South Korea and Japan) seek these larger, more complex, and more expensive long-range maritime systems to maintain maritime domain awareness.

Middle East/North Africa Region



The Middle East and North Africa (MENA) contains over 50% of the world's oil reserves used to fuel the global economy.[3] It is also characterized as one of the world's most security challenged regions. The MENA region's defense spending is predominantly driven by significant threat environments and steady oil economies.

Militarization is especially pronounced in the MENA region relative to population due to the regional tensions, the region's geopolitical importance and the oil reserves.[4] These factors combine to characterize the region and have attracted foreign influence and foreign investments further supporting military procurements as well as the recent growth of military industrial capabilities in some countries. Aircraft procurement in the MENA region favors fighters over helicopters and unmanned aerial systems (UAS) among the majority of the nations with the economic power to purchase military aircraft. These affluent nations are relatively stable, facing controllable internal threats and are instead focused on regional threats from nations with ideological differences or volatile and unstable governments threatening their borders. Fighters can cover the long ranges of these threats and also provide these nations with the power and prestige they seek. However, rotorcraft and UAS market opportunities are still robust among nations with the need to support ground combat forces, combat internal threats, cover complex terrain and persistently monitor threats to their borders.

There is limited aircraft production in the MENA region that drives foreign procurements for three reasons. First, oil revenues and US military aide allow governments to purchase rather than produce defense industry goods, thereby removing a degree of internal motivation for

independent production. Second, there is little developed industrial capability to build on in the region due to a late entry into the industrial revolution. This fact, combined with the ability to purchase assembled products abroad when needed also limits their motivation for independent production. Third, the security situation in the region requires top tier defense systems that their industrial capabilities are far from being able to produce. This forms a gap between current industrial capabilities and the capabilities required that the countries of the MENA region are not likely to close in decades. Countries like Israel and Turkey realize the strategic, industrial and economic need for independent military production and are beginning to build their defense industrial base through joint ventures, licensed production, component production, independent industrial development and government support but only account for a small portion of the MENA aircraft market share.

Europe

Because of its geographic situation, Europe faces multiple security threats to include border and maritime security, terrorism and a resurgent Russia. Recent developments with Russia's annexation of Crimea demonstrate the willingness of the use of military force to achieve national objectives. Russia's assertiveness is seen from a European point of view as an increasing threat. While the Russian threat is still a major concern, the end of the cold war sent European defense spending on a long, gradual downhill trend over the last two decades.

Additionally, individual European countries are influenced by whether or not they are

members of the European Union (EU), the Eurozone common currency union, the North Atlantic Treaty Organization (NATO) and the European Defense Agency (EDA). The EU is bringing European countries into closer political and economic alignment and attempting to open defense procurement across Europe. NATO and the EDA have initiatives to bring a coherent, European wide approach to military planning, force structures and procurement. European countries rely on military alliances to meet security needs during this era of declining defense spending. The main one would be NATO, backed up by the United States. The EU established a European Security and Defence Policy (ESDP), which includes non-NATO countries but is limited to EU members. The EDA should provide assistance and guidelines to help EU countries to meet targets set by CSDP. Baltic countries also face security concerns due to proximity to a Russian sphere of influence. These countries cooperate through the Nordic Defense Cooperation (NORDEFCO). Other sub-regional arrangements include the, UK-France Defense Cooperation (Lancaster House Treaty, the Visegrad-4 and the Benelux Defense Cooperation. The effort behind all these initiatives is to get a higher level of mutual cooperation when dealing with common security issues.

Political drivers of aircraft procurement include national budget constraints that limit defense spending and protecting indigenous national defense production capabilities. European defense budgets are under pressure from social programs since the end of the Cold War and the reduced threat to NATO from the Warsaw Pact. Austerity measures in the wake of the global financial crisis of 2008 are an additional pressure on defense spending with no apparent end in sight.

Aircraft procurement spending is generally one of the most important topics of defense budget because of the high costs involved. Thus, aircraft procurement and the way contracts are awarded and to whom are strong political decisions with diplomatic and military consequences. Cooperation between countries sure is a way to address cost issues but also and probably mostly a way to build military alliances and to get support from other countries.

European countries have extensive defense industrial base (DIB) capabilities and view those capabilities as inherent parts of their national security strategies. There is a long tradition of protecting defense markets to support indigenous firms and favoring those firms in procurement decisions. The financial crisis and slow economic recovery across Europe make protecting DIB firms and the jobs they sustain more important considerations than ever.

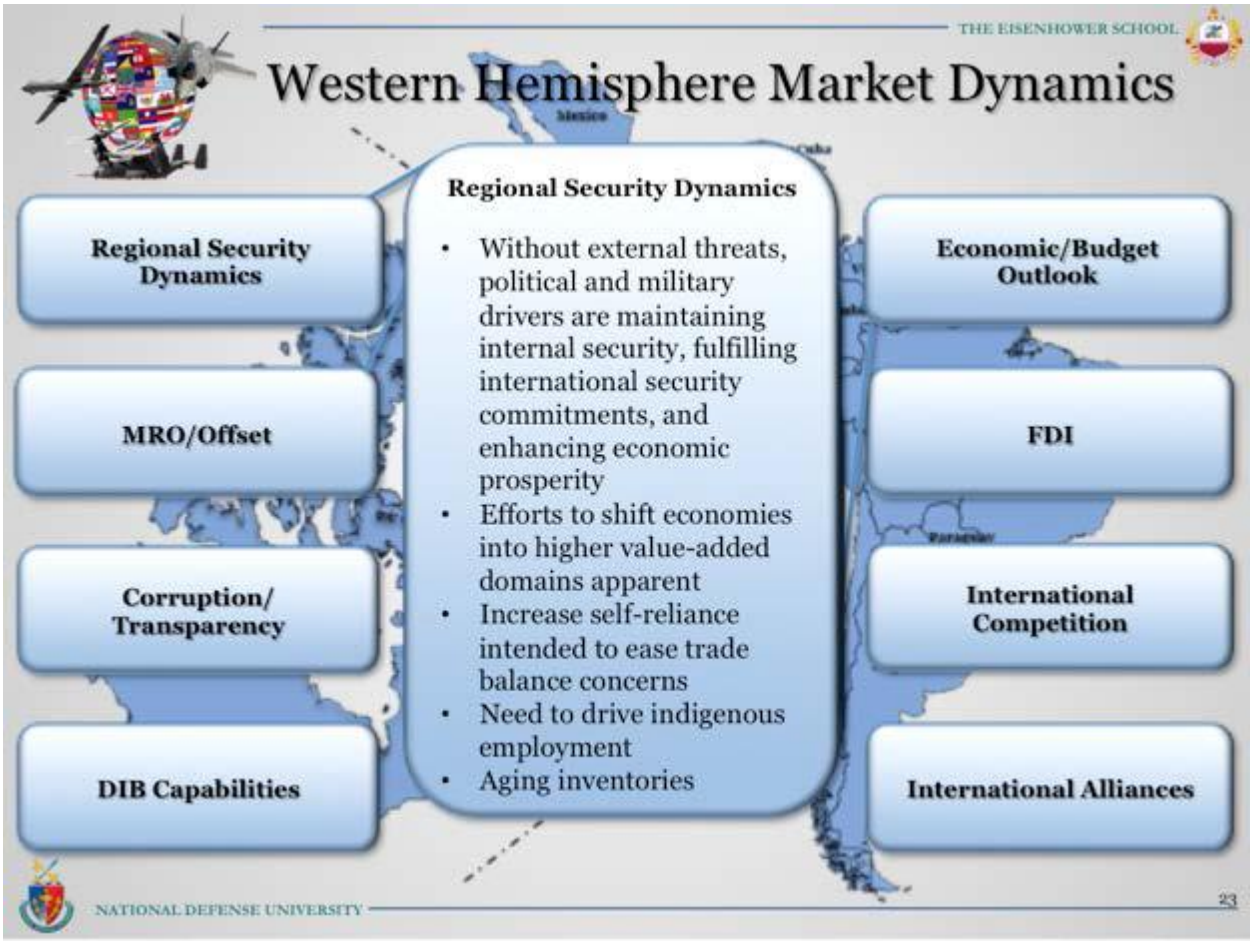
Military drivers of defense procurement include individual sovereign security needs, the requirement to support regional alliances (NATO) and long term trends in force structure reductions and defense modernization white papers. Additionally, the sub-regional defense cooperation initiatives influence the type of military capabilities required.

A number of European wide defense initiatives are aimed at maximizing defense spending during the long post-cold war decline, made more acute by the global financial crisis. EDA's pooling and sharing initiative and NATO's "Smart Defense Initiative" endeavor to close European capability gaps, reduce redundancies in national capabilities and also to ensure niche and community-wide requirements are met. EDA pooling and sharing initiatives on ISR, smart munitions, and maritime surveillance (MARSUR) are examples. Countries that participate in NATO's Partnership for Peace and aspire to NATO membership are also concerned with NATO interoperability that influences procurement decisions.

Finally, NATO resource planning focuses on the financing of capabilities that are jointly or commonly funded, where members pool resources within a NATO framework. Joint funding covers activities managed by NATO agencies, such as the NATO Airborne Warning and Control System (AWACS) and the NATO Airlift Management (NAM) Program (under the NATO Support Agency); while common funding involves three different budgets; the civil budget, the military budget, and the NATO Security Investment Program.

Since there is not a strong and powerful political lead in Europe that would establish a common policy and common acquisitions, Europe has developed several ways to build military alliances and industrial capacities, relying on different kinds of national interests. Those dynamics also drive the way defense budgets are established.

Western Hemisphere



The regional security dynamics in the Western Hemisphere are different in Central and South America in comparison to the security dynamics in Canada and are therefore discussed separately. As for Central and South America, the regional security dynamics driving defense spending are dominated by internal security requirements and to support counter narcotics efforts challenging the legal authority in the region. Other drivers include border protection and patrol, protection of natural resources in larger and more remote countries, the need for modernization of outdated systems, and military commitments to international organizations.

Central and South America are plagued by the existence of organized crime groups engaged in a vast illegal narcotics trade.2 Colombia, Peru, and Bolivia are considered the world's largest cocaine producing countries, while Mexico is the staging area for drug trafficking into the US.3 Internal security also challenges several countries in Central and South America and stem from several governments unable to effectively provide stability and security. These security dynamics drive Central and South American governments to devote significant resources at combating well financed drug cartels with modern weapons and equipment. Government spending dedicated to combating drug cartels also limits funding for governments taking attention away

from improving economic and domestic programs which results in greater political unrest and public protests.

The ability to maintain border security is another key security dynamic in Central and South America. While nearly all the countries in the Western Hemisphere are free of threats from other nations, isolated incidents of border disputes do exist throughout the region. However, a more common border security issues are border violations by illegal immigration between nations and illegal drug trafficking across unprotected borders. Policing borders is made even more difficult with the rugged terrain and the extensive length of some of the borders in the Central and South American Region. Territorial disputes are also a defense driver in the region. In the north, Canada is disputing territorial rights of the Arctic as Russia periodically lays claim to land near the North Pole.7 At the south pole, Chile is strengthening its sovereignty in Antarctica and engaged in peaceful discussions over Bolivia's access to the Pacific Ocean.8 Other countries, such as Brazil, are less concerned about state-on-state disputes, but are concerned with immigration and cartels infiltrating their country.9

Natural resources are major economic drivers for many of the Central and South American nations. Their need to protect these natural resources drives defense spending as well. The vast abundance of oil throughout the region extends territorial claims into the oceans which complicate border and sovereignty rights.10 Countries such as Brazil and Argentina have natural resources in remote areas in need of government monitoring and protecting driving their aircraft needs.

The need to modernize aging equipment is another driver of aircraft procurement in Western Hemisphere nations. While Canada and Chile have been actively upgrading their military capabilities, almost all of the other countries possess outdated military equipment originally procured as early as the 1960s.11 For example, Brazil's emergence from a military dictatorship have prevented meaningful defense spending for many years.12 With many sitting governments simply focused on preventing overthrow from cartels or insurgencies, in addition to the current economic landscape, they have not been able to continually maintain modern equipment. Venezuela, by contrast has been under US weapons sanctions for many years, forcing the country to ally with China and Russia for military equipment.13 As a result, modernization typically becomes a "need" versus "want" scenario. Finally, international participation through the United Nations (UN), particularly interoperability, drives military procurement. Countries that do not face serious internal security problems, such as Canada, Chile and Uruguay, are able to participate in international peacekeeping operations.14

Commonwealth of Independent States (CIS)

The CIS is an alliance of nations formerly within the Union of Soviet Socialist Republics (USSR). It has become a forum for human rights, defense cooperation, and trade and economic collaboration. Some former countries, such as Georgia and Turkmenistan, are not formally members. Geostrategic issues within these countries relate to balancing a relationship with Russia and China for the eastern countries, and Russia and Europe in the west. Ukraine has never ratified participation, as it is more westward looking and would prefer to be considered for NATO participation. The region is a vast topographical expanse that is rich in its diversity of ethnic, religious, defense, and economic interests. Security issues exist, and are not limited to, areas within Georgia, Chechnya, Ossetia, and Ukraine.

Many CIS countries are rich in natural resources. Mining, use processing and exports of mineral resources is one of the main kinds of economic activities for many states of the Commonwealth. As a whole, CIS states take one of the first places in the world by volume of explored resources of gas, petroleum, coal, iron and manganese ores, many non-ferrous metals, potassium salts and other important kinds of minerals.

The market size and opportunity for the various countries within the CIS states is relatively smaller than Western Hemisphere comparisons. However, some opportunities exist for unmanned systems. Within this mineral rich and resource dependent region, the four countries identified with possible opportunity consist of Azerbaijan, Kazakhstan, and Ukraine, and Uzbekistan.

Total defense budgets are relatively small when compared to other global regions. However, several countries show positive signs of growing procurement budgets, rapid defense

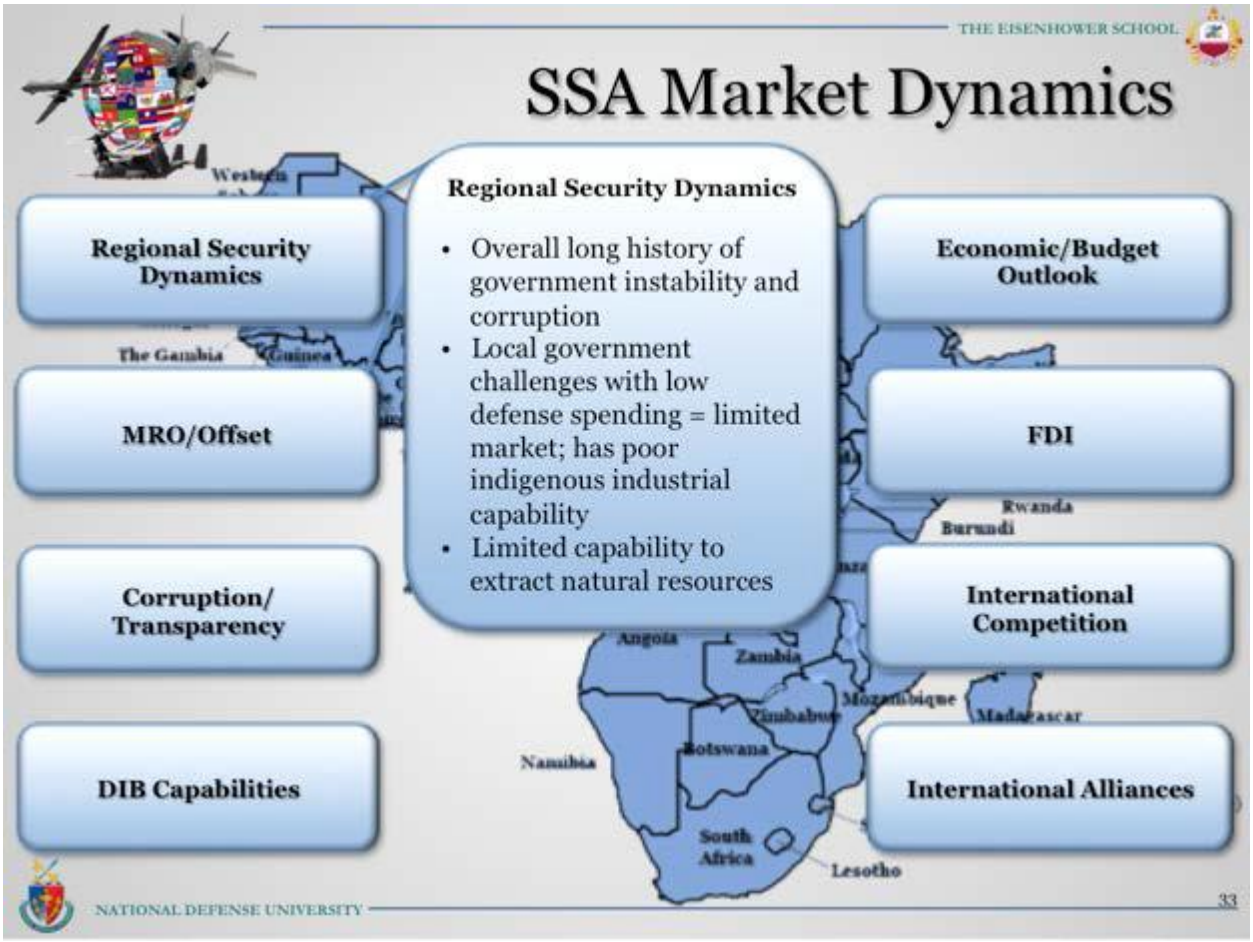
growth, and the emphasis on ISR capability requirement. Kazakhstan will have the highest projected GDP growth over the next several years peaking in 2018. Azerbaijan and Uzbekistan also show an upward trend regarding GDP growth rate however, a much smaller rate and total amount peaking in 2018.

Regional challenges include significant political and economic instability, widespread corruption, and limited transparency. Each of these challenges varies from country to country. Furthermore, indigenous industrial capability and infrastructure are poor.

The drive to maintain stability internal to national borders is a key driver for defense spending in some nations. In some cases, the government faces criminal activity, such as is the case for Tajikistan for its border with Afghanistan. In other cases, the driver for military expenditures is to limit the influence of the threat of other nations, such as Russia in the case of Ukraine and Georgia.

Overall, this region places focus on upgrades and modernization of older conventional equipment typically received from Russian sources or US partner capacity sources. A few countries have identified aerospace systems as a priority and place emphasis on counter-insurgency, air defense systems, or ISR capability. Utility helicopters and small/tactical UAVs support multiple requirements including mobility and organic ISR.

Sub-Saharan Africa



Sub-Saharan Africa faces multiple security threats from border disputes to the rise of radical insurgencies. Conflicts in Sub Saharan Africa are rebel groups and paramilitary factions seizing regional control of territory, resources and populations. Central Africa faces threats to

national stability from rising insurgencies. In the western part of central Africa, Boko Haram threatens a Nigeria that is growing in both population and economic prosperity. In Africa's central east, the African Mission in Somalia (forces from Uganda, Burundi, Kenya, Nigeria, Sierra Leone, and Djibouti) has been fighting the forces of Al Shabaab. Likewise, US forces have been supporting efforts against the Lord's Resistance Army, al-Shabaab, and al-Qaeda affiliates in the east and mid-central region.[4]

Although Africa is rich in resources, its level of economic development is largely hampered by a lack of political development toward maturing democracies, which undermines the rule of law and protection of private property. These are necessary preconditions for steady economic development. In most cases, the ruling parties in Sub-Saharan nations either foster, or are unable to limit, the corruption that undermines investment. The nation of Botswana provides one of the few exceptions in the Sub Saharan region because its former ruler decided to put it on a path that supports economic progress and limits corruption, which benefit of emerging businesses, which in turn fosters individual effort.

ECONOMIC AND BUDGETARY ENVIRONMENT

US Original Equipment Manufacturers (OEMs) face challenges in exporting aircraft to international markets due to smaller foreign defense budgets as well as the relatively higher cost of US products. Outside of foreign military financing or another type of security assistance funding scheme, foreign markets overall must make tradeoffs when deciding to purchase military equipment from overseas. An assessment of foreign procurement budgets can determine a country's ability to buy defense equipment, regardless of geopolitical, regulatory or diplomatic factors. Additionally, foreign defense budgets may not necessarily reflect a country's aircraft requirements or its ability to sustain the lifecycle of the platform.

According to IHS Jane's Defense budget forecasting, the top three regions with the largest forecasts for total defense procurement spending from 2015 through 2019 are Asia Pacific (AP) with 29%, Europe with 18%, and the Middle East and North Africa (MENA) with 9%. As shown in the data tables in annex (1) to this appendix, the order changes slightly when sorted into air force specific procurement budgets. Between 2015 through 2019, Europe has forecasted the largest budget for their air forces' procurements with a total of $106 billion. Asia Pacific countries have budgeted the next largest amount at $83 billion, and the MENA countries have budgeted $62 billion. The air force budgets of South and Central American countries, Sub Saharan Africa countries, and the Former Soviet Union Republics, totaled $22 billion.

Defense budgets, and specifically materiel procurement budgets, could be thought of as one way to assess the sum total of a nation's consideration of its perceived threats, economic power, financial power, industrial goals and policies, tolerance for risk, and the political implications of a "guns or butter" debate. The bottom line is that a country cannot buy exportable defense articles from US OEMs if they don't have the funding to afford it whether provided by their own treasuries, foreign military financing, other security assistance programs, or other financial arrangements. Once there is a budget to compete for, the other factors come into play. These can include the political will of the US and the buying government and the will of the manufacturer to pursue a sale in consideration of the many cultural, corporate, legal, and regulatory hurdles. In addition to these factors and the competition among existing competitors that market, the US firm may also have to navigate offset arrangements, industrial participation expectations, transfer of US technology and intellectual property, and local rules governing foreign direct investment. All this must be weighed against a degree of risk in transparency and corruption in the foreign country the OEM is willing to tolerate. Some of these other risks can be assessed by considering the overall economic health of a country by evaluating its gross domestic product, its

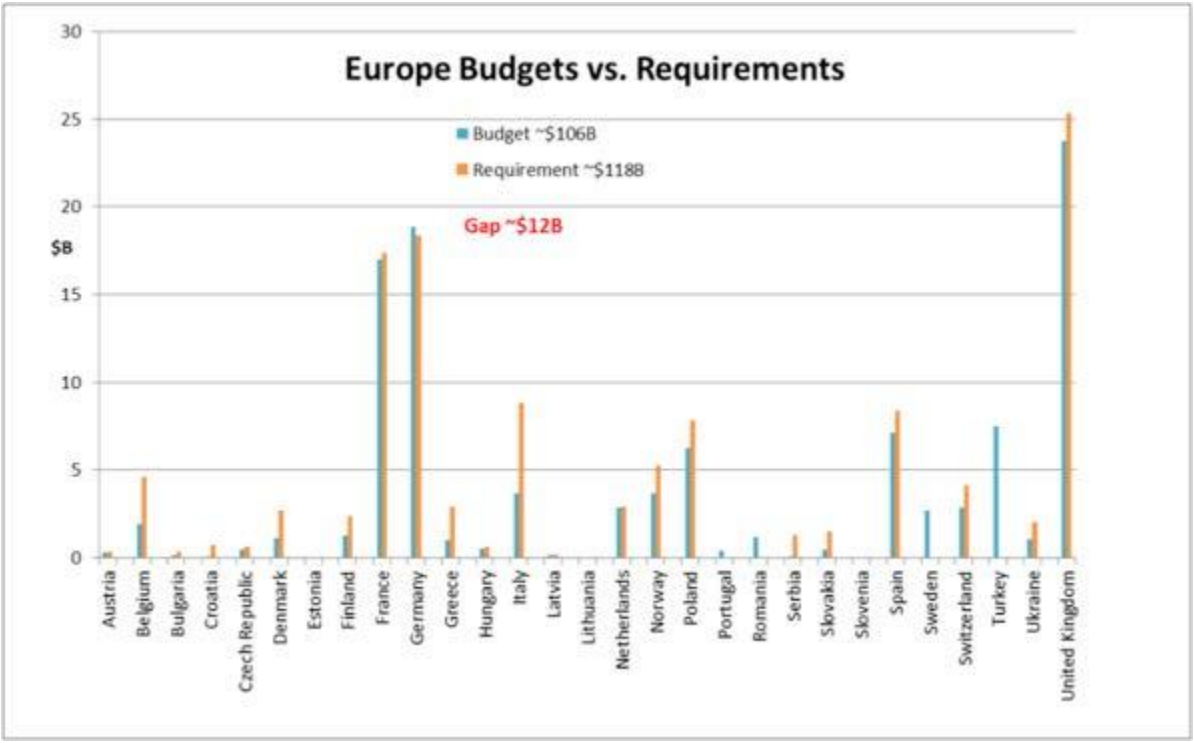
economic growth rates, inflation rates, foreign direct investment rates, natural resources and other statistical macro-economic factors.

Budget forecasts are only part of the story in analyzing export opportunities for US OEMs. Another important aspect to look at is the procurement requirements each country has to see where a US OEM's products might fill a requirement. Comparing the air forces' procurement requirements against each country's air forces' procurement budget forecasts reveals a distinct trend where with few exceptions most countries' requirements exceed budgets. All three focus regions of this paper have more requirements than they have budgets to pay with. The largest gap is in Asia Pacific at $33 billion. Next is MENA at $31 billion, and last is Europe with only a $12 billion gap between requirements and budgets over the next five years. It should be noted that the Asia Pacific figure includes $25 billion of gap for India alone, and that for the North East and South East Asian countries (excluding India) the gap between budgets and requirements is almost identical to Europe's at around $12 billion.

The bar charts below show a comparison of each country's total air force procurement budgets vs. total air force requirements for the 2015-2019 timeframe. Defense procurement requirements could be thought of as a measure of what each country believes it needs to cope with its perceived future threats. Each chart includes the aggregate budget, requirements, and gap for all the countries in that region for the same timeframe. Annex (1) to this appendix lists the detailed data per country, per year, per program from which these bar charts were derived.

The spider charts below show a graphic presentation of qualitative assessments of economic favorability factors for the AP, MENA, and European regions. A data plot towards the outer ring equates to a more favorable rating for that country for that parameter. In the AP, MENA and Eastern European regions, there seems to be a clear correlation between political stability, GDP growth and low corruption. In the Western European region, these correlations are less pronounced. The following charts represent the lowest gap (Europe) to the highest gap (AP) in terms of budgets and requirements. Figures 1, 2, and 3 pertain to Europe.

In Europe, the total budgets at up to $106 billion, but the total requirements add up to $118 billion. This $12 billion gap is the lowest among the three regions. As a result of the 2007 and 2008 economic crises, many European countries scrutinized, reviewed, and reduced their defense spending plans. With aging populations, social spending demands, a desire to maintain a technically advanced defense industrial base that drives such a large amount of employment and economic activity, and a resurgent Russia still years away from the conflicts in either the Crimea or Eastern Ukraine, there is a rational for a metered reduction in defense spending with an accompanying close review of requirements in order to preserve as much defense related industrial independence and economic activity. Many European defense programs were started at a time where the threats and economic outlooks were clearer and larger. A carefully contracted defense sector that maintains core activity by drawing out programs and reducing spending seems to be a natural reaction to the economic and security downturns toward the end of the last decade.



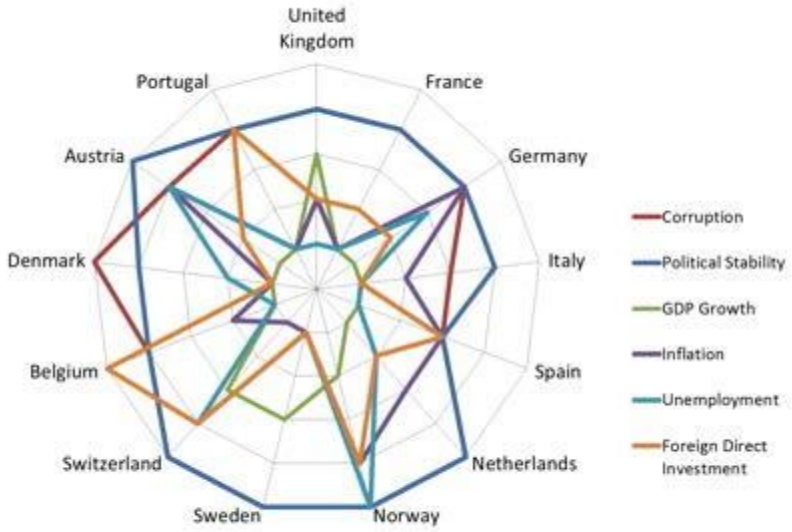


Figure 2: Western European Region Economic Favorability
(Qualitative scale from 1 (low) to 5 (high) of country's favorability factors)

Source: Jane's IHS, World Bank, IMF accessed via NDU databases. Jan – Mar 2015.

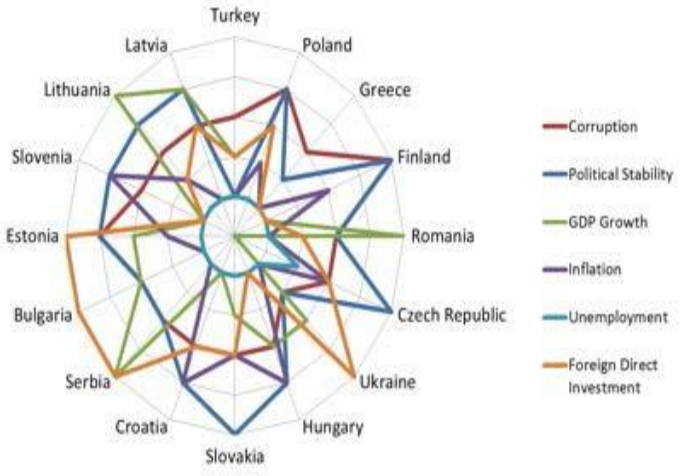


Figure 3: Eastern European Region Economic Favorability (Qualitative scale from 1 (low) to 5 (high) of country's favorability factors)

Source: Jane's IHS, World Bank, IMF accessed via NDU databases. Jan – Mar 2015

All the European countries, except for perhaps Norway, fail to clearly trend all factors in the most favorable directions. Some countries that one might expect to have more favorable ratings do not, such as NATO partner Turkey. This lack of homogeneity could reflect the economic nature of Europe and the European Community at large, showing a representation of the uniqueness of each country's identities, national interests, and individual approaches to economic and defense matters.

Middle East and North Africa

The next biggest gap is in the MENA region. Aside from Egypt, the countries with the biggest gaps between budgets and requirements seem to be the ones who can best afford it. Despite a budget deficit of nearly $229 billion this year, the first in many years and caused by the recent drop in the price of oil, Saudi Arabia is still reported to have upwards of $700 billion in foreign assets saved reserve accounts. A $15 billion gap between requirements and resources seems manageable compared to a $700 billion savings account, especially in the context of the current instability of regional security dynamics.[5] Except for Israel, all these countries are of the Arab Sunni sects of Islam, and likely all perceive an existential threat from a resurgent and prominently Shia Iran. In this Iranian threat, they share a common interest with Israel. These countries large piles of cash allow them to amass a large conventional deterrent to a growing perceived threat from Iran. Their balance sheets also mean that the $31 billion gap represents the least implication to their economies since they can just "write a check" for whatever they want to buy. Again, except for Israel, none have any significant indigenous defense industries. As the world's energy demands steadily grow, largely fueled by the growing economies of the Asia Pacific, they can rely on increased year on year revenues from exports of extracted hydrocarbons and associated

financial services systems. Israel does have a relatively small but highly sophisticated defense industrial base that is focused on the export and transfer of high technology components for integration or retrofit of weapon systems of buyers that are eager to avoid United States regulatory restrictions.

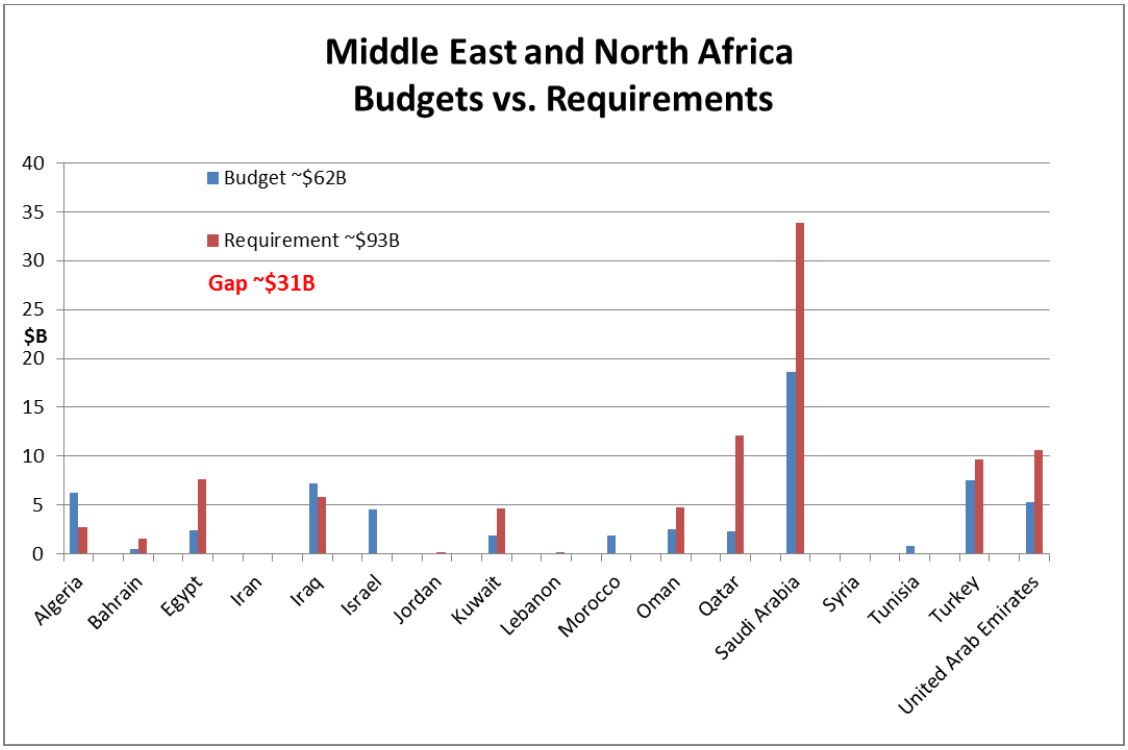
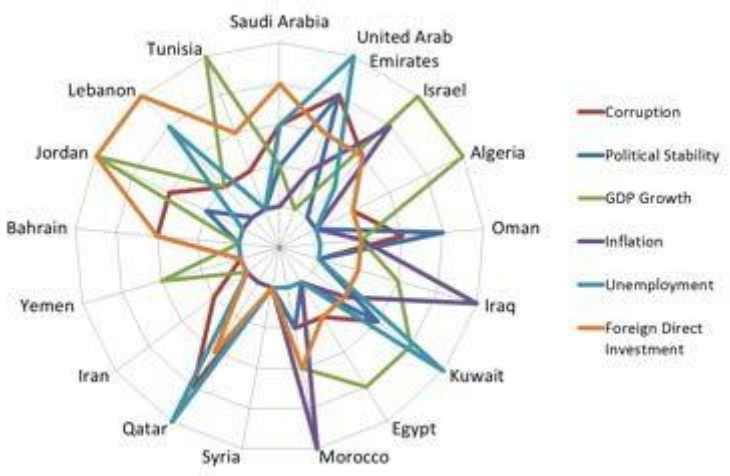


Figure 5: Middle East/North African Region Economic Favorability (Qualitative scale from 1 (low) to 5 (high) of country's favorability factors)

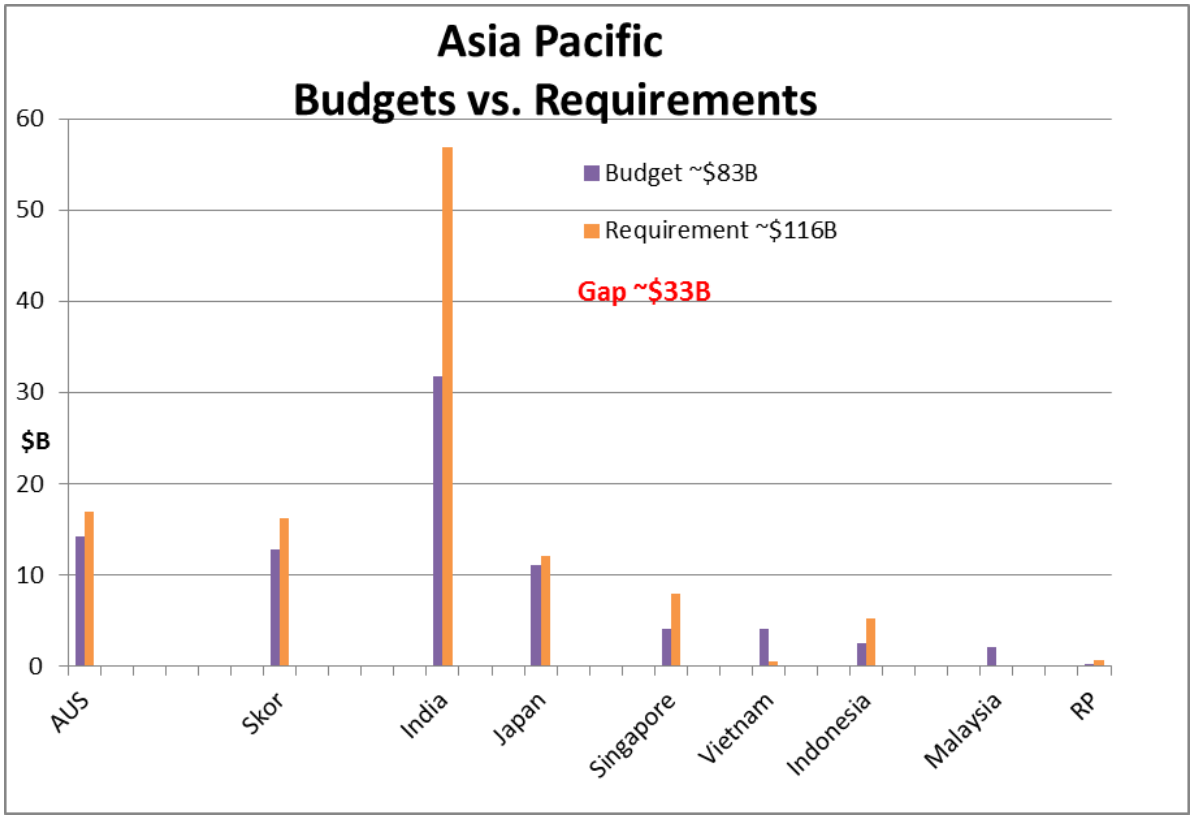
Source: Jane's IHS, World Bank, IMF accessed via NDU databases. Jan – Mar 2015.



The largest gap between budgets and requirements is $33 billion over the next five years among the nations of the Asia Pacific region. Despite the largest gap, it seems that all in all, the Asia-Pacific region is where defense procurement is most healthy. It is growing at sustainable rates and is backed by solid diversified export economies. Most countries do not have too large a gap, but India is obviously driving the overall total. In fact, India alone accounts for about $25 billion of the $33 billion in gap. Some structural problems might exist because of their non-standardized methods of costing procurements, as evidenced in the recent Rafale Fighter hiccup where the Indian MoD apparently balked once they computed the total cost of ownership instead of just adding up the unit flyaway costs.[6] Despite the structural hurdles associated with the Rafale sale, Indian press has recently reported that India will buy 36 Rafales outright, a decision that Prime Minister Modi arrived at due to perceived security threats and Modi's ability to cut through bureaucratic red tape.

India also has the most restrictive offset and foreign direct investment rules. There may be many reasons for such a large gap in India's ability to reconcile budgets and requirements, but the most plausible are, in addition to what one would expect of the bureaucracy associated with governing such a large democracy, political gaps between civil and military, and perhaps in shifting from a near socialist commanded economy to one driven more open and driven by market forces they simply have not constructed adequate methods or internal controls with which to evaluate the totality of their defense and economic enterprises. India does have one of the most inefficient manufacturing segments in Asia; a good example often cited is that it costs twice as much for India's prime aircraft manufacturer, Hindustan Aeronautics Limited, to produce a SU-30 Flanker as it costs for Sukoi to make one in Russia. India does run the risk of deterring US (or any other foreign OEMs) due to its uniquely heavy local manufacturing requirements while at the same time severely limiting investment and offset opportunities. Some OEMs could conclude that it is nearly impossible to do business in India and be deterred from their market, despite its huge long term potential, and the geo-political strategic implications of long term defense-trade-diplomatic alignments. Of all these countries, Japan, and Korea have the narrowest, even negligible shortfalls. Australia is in the middle of these gap rankings, but aside from air force programs is also faced with a $20 - $39 billion submarine program and a $8 billion air warfare destroyer program to fit inside of a total procurement budget of about $31 billion (50% shortfall.)[7]

The worldwide gap (for the 3 largest export markets) totals $76 billion in 2015 dollars. US OEMs whose financial solvency might depend on export markets to attain minimum profitable production quantities might want to review their programs' business case analysis to determine their vulnerability to shifting budgets, requirements, and possible reduced order numbers. Some OEMs could find previously profitable assessments border on or have crossed into order numbers that would equate to a net loss for the program. They might want to find efficiencies, reduce costs, sell harder to open more markets to increase sales, or they could find it in their best interests to exit the defense market. Since there are only a few US OEM prime contractors, a decision by any one of them to exit the defense market could have very serious implications for the national security of the United States and its ability to manufacture the required quantities of arms and weapon systems, at the required rates, from the required or desired sources. The bottom line is that continuing programs based on international market forecasts without further budgetary investigation might risk inaccurate decision-making.



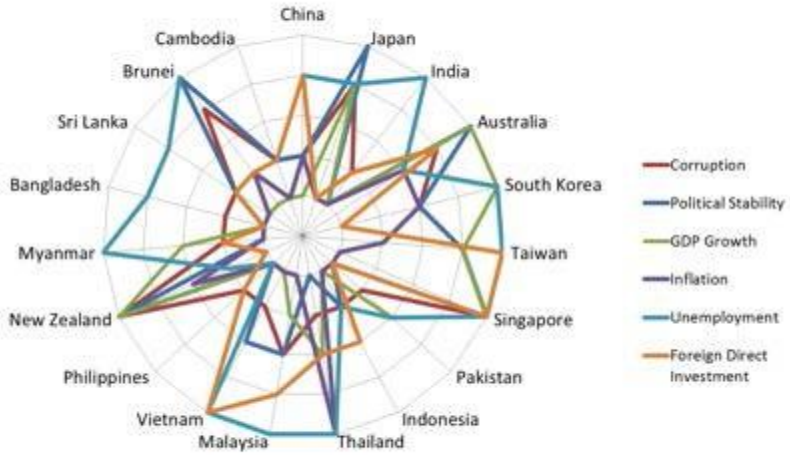


Figure 7: Asia-Pacific Region Economic Favorability
(Qualitative scale from 1 (low) to 5 (high) of country's favorability factors)

Source: Jane's IHS, World Bank, IMF accessed via NDU databases. Jan – Mar 2015.

MAINTENANCE, REPAIR AND OVERHAUL (MRO) OVERVIEW

The maintenance, repair and overhaul (MRO) market is growing as a potential source of increased revenue for US Original Equipment Manufacturers (OEMs). OEMs are beginning to see MRO as a natural extension of their current business models to provide continued lifecycle

support to existing platforms. The demand for MRO services is driven by aging military equipment, technological innovations in the industry, internal and external security threats, territorial disputes, and modernization initiatives undertaken by armed forces across the world. In general, an indigenous MRO capability is used to increase autonomy as well as improve a country's industrial capability, labor force, and economy. This summary section will briefly address the key MRO trends for fighters, unmanned aerial vehicles (UAVs) and rotorcraft.

The F-16 Fighting Falcon is an example for future MRO opportunities. It is the most common fighter aircraft in the world, operating within 25 nations and will generate 31% of the MRO demand over the next decade. Countries are modernizing their existing aircraft fleets in an effort to keep them relevant in today's rapidly evolving, high-tech, net-centric battle space. They are also extending the service lives of their fleets in an effort to bridge the gap until the generation of tactical combat aircraft becomes operational. This modernization trend is reflected in current F-35 customers who have become acutely aware that they will be unable to purchase sufficient numbers of high-end, 5th generation aircraft over the next 10 years. As a hedging strategy, they are extending the service lives of the F-16s and improving the performance of existing fleets in order to meet their future national security needs with a more diverse and cost effective high/low mix of aircraft.

The global market for military rotorcraft MRO is expected to be dominated by North America, followed by Europe, and Asia Pacific. Despite the economic crisis in Europe, the European share of the global market is projected to increase, albeit marginally.

MRO market opportunities represent a unique challenge for UAV markets. MRO constructs are a relatively new, even for more mature aircraft markets in the US and Europe. Tactical UAVs have not been operational long enough to accurately assessed long-term life cycle and MRO cost but that knowledge and experience is continually evolving particularly within the US Department of Defense (DoD).

Two factors are emerging that will drive a future UAV MRO demand. First, the global demand for these persistent, ISR systems that will drive a corresponding increase in MRO needs. Second, countries that procure more advanced medium altitude long endurance (MALE) and high altitude long endurance (HALE) systems will need capable MRO support in order to maintain the airframes, as well as the sustaining their more complex sensor suites, avionics and engines.

Asia Pacific: MRO

Asia Pacific: Fighter MRO

The fighters in the five top-tier AP countries (Japan, ROK, Australia, Singapore, and Taiwan) will all be well supported with advanced indigenous MRO capabilities. But even these relatively self-sufficiency countries will continue to rely on external technical support from international OEMs. AP countries are especially reliant on US companies for support for their modern afterburning turbofan engines and sophisticated mission systems (e.g. radars and data links). However, the MRO market opportunities for US companies within the more developed AP countries will dwindle over time as their domestic technical skills and industries improve. These countries include South Korea, Japan, Australia, and Singapore. Much of the MRO growth will occur in the less industrialized countries like Indonesia, Malaysia and Thailand. These countries have limited domestic industrial capacity and rely heavily on international support from the US, Russia, and Sweden (in the case of Thailand) in order to maintain their smaller yet increasingly sophisticated fighter aircraft fleets in an airworthy condition.

Similarly, there are numerous upgrade/modernization opportunities for US OEMs in the AP region. Aging fighter fleets and the high price of recapitalization drive the upgrade demand. There are also concerns in South Korea, Japan, Australia, and Singapore (a potential F-35 customer) about the Lightning II's program delays, performance limitations, and cost overruns. These and other domestic concerns are driving all these countries to extend the service lives and upgrade many of their existing 4th generation fighters.

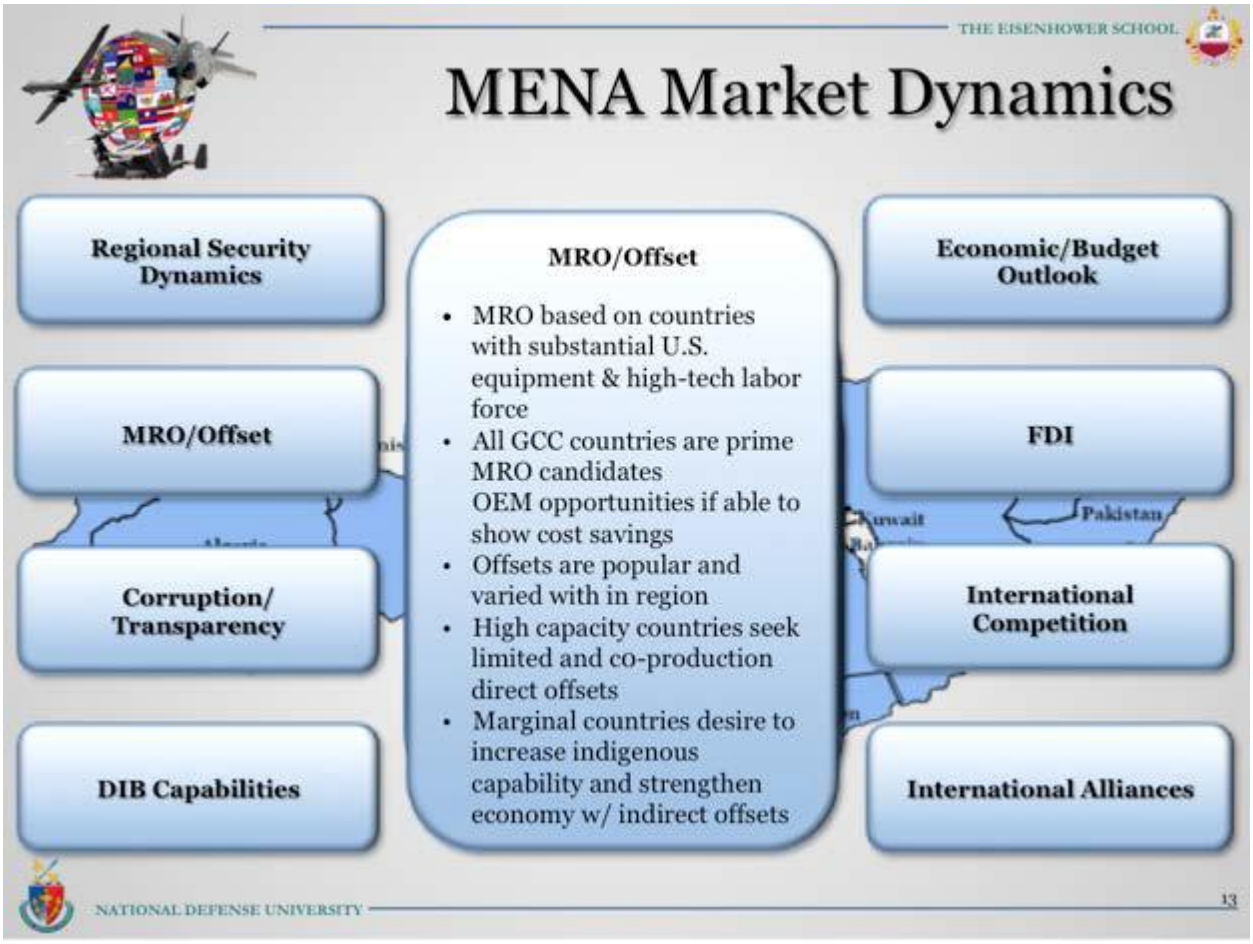
Asia Pacific: UAV MRO

There are two categories of countries within the AP UAV segment. The first group relies more on US export systems and MRO support. These countries includes Australia, Indonesia, Malaysia, and someday, maybe Vietnam. The more self-sufficient countries include Japan, ROK, Singapore, and Taiwan. These nations operate sophisticated UAVs and offer indigenous MRO capabilities that will make it harder for US OEMs to compete.

Asia Pacific: Rotorcraft MRO

MRO and upgrades for helicopters are a cost-effective method to decrease capability gaps in AP. MRO and upgrades require several conditions in order to be lucrative US OEMs. These include (as a general rule) sizable defense budgets, inventories greater than 30 helicopters, and a skilled labor force. Three countries meet this criteria: South Korea, Japan, and Taiwan.

Middle East/North Africa: MRO



Middle East/North Africa: Fighter MRO

MRO opportunities in the MENA region are plentiful, with most GCC countries looking to upgrade their existing fleets. There are challenges in the region dealing with local rules and regulations as well as finding adequate skill labor but there are opportunities for US OEMs.

Lockheed is in an especially competitive position with their venerable F-16s being the most prevalent fighter in the region. Boeing has opportunities in the region as well with Kuwait flying F/A-18's and Saudi Arabia flying F-15's. Currently, only 4 MRO facilities exist in the region: two in Saudi Arabia and two in Turkey.

Middle East/North Africa: UAV MRO

MRO is limited in MENA due to the limited number of UAVs in the region. Opportunities for US OEMs may grow as countries acquire medium altitude systems with more advanced sensors. The preponderance of UAVs operated in MENA are lower cost tactical assets. These low-cost systems have minimal MRO and upgrade opportunities of foreign OEMs.

Middle East/North Africa: Rotorcraft MRO

The MENA region currently ranks fourth in global helicopter market revenues with potential for growth. The area's wealthy, petroleum based economies are rife with domestic threats and instability that is driving demand for modern military equipment. A large number of US produced rotorcraft are already in the region thus giving the incumbents a competitive edge for future sales, MRO and upgrades. Countries providing the most significant MRO opportunities include Saudi Arabia, UAE, Egypt, and Turkey.

Saudi Arabia represents a significant opportunities for MRO and upgrades in addition to the potential to develop future joint ventures (JVs) for local aircraft assembly – similar to Turkey's S-70 JV with US firm Sikorsky. The UAE is interested in developing an organic ability to provide MRO and upgrades for their indigenous rotorcraft fleet. Turkey sees itself as a center for aircraft support given its strategic geographic location. Therefore, Turkish MRO and upgrade facilities provide additional opportunities for foreign investments and US suppliers. Finally, Israel does not directly produce rotary wing aircraft yet their aerospace industry is highly developed and in many cases is a direct competitor with US firms for subcomponents, MRO and upgrade services.

Europe: MRO

Europe: Fighter MRO

European fighter MRO opportunities lie with the relatively large fleets of F-16s and F-18s and will slowly emerge for the F-35 as that platform becomes operational and more proliferated. The US primes (Lockheed Martin and Boeing) may also be able to capitalize on a growing demand in central Europe for lower cost, second-hand fighters. These used fighters will need service life extension and modernization upgrades in order to meet NATO's interoperability standards.

Europe: UAV MRO

European UAV fleets are relatively small in numbers when compared to rotorcraft and fighters. UAV fleets are also more diversified and have fewer common subsystems (e.g. engines) than other European platforms. The diversity of platform types along with their relatively low prices make assessing specific MRO opportunities in the region more difficult. However, demand for maintenance, overhaul, and upgrades continue to grow in Europe – especially for US sales of MALE and HALE UAVs.

Europe: Rotorcraft MRO

Poland has a great deal of potential for future rotorcraft MRO and upgrades. The country

has a sound economy with a large number of helicopters and has as a skilled labor force and a vibrant industrial base.

The Czech Republic, Italy, the Netherlands and the UK all have strong economies with reasonably sized military forces and defense budgets. US OEMs are already present in these countries along with competitors from European OEMs.

Western Hemisphere: MRO

Western Hemisphere: Fighter MRO

Opportunities for MRO and upgrade are low, especially in the fighter aircraft segment. Canada has the largest fleet of fourth-generation aircraft in the region and offers the biggest MRO potential for US firms. Argentina, Brazil, Chile, and Peru all have some indigenous aircraft MRO capabilities and are open to foreign competitors but the markets are relatively small. The small fighter markets are driven by fragile economies and internal domestic security needs that do not necessary include large fleets of high-end fighters.

Western Hemisphere: UAV MRO

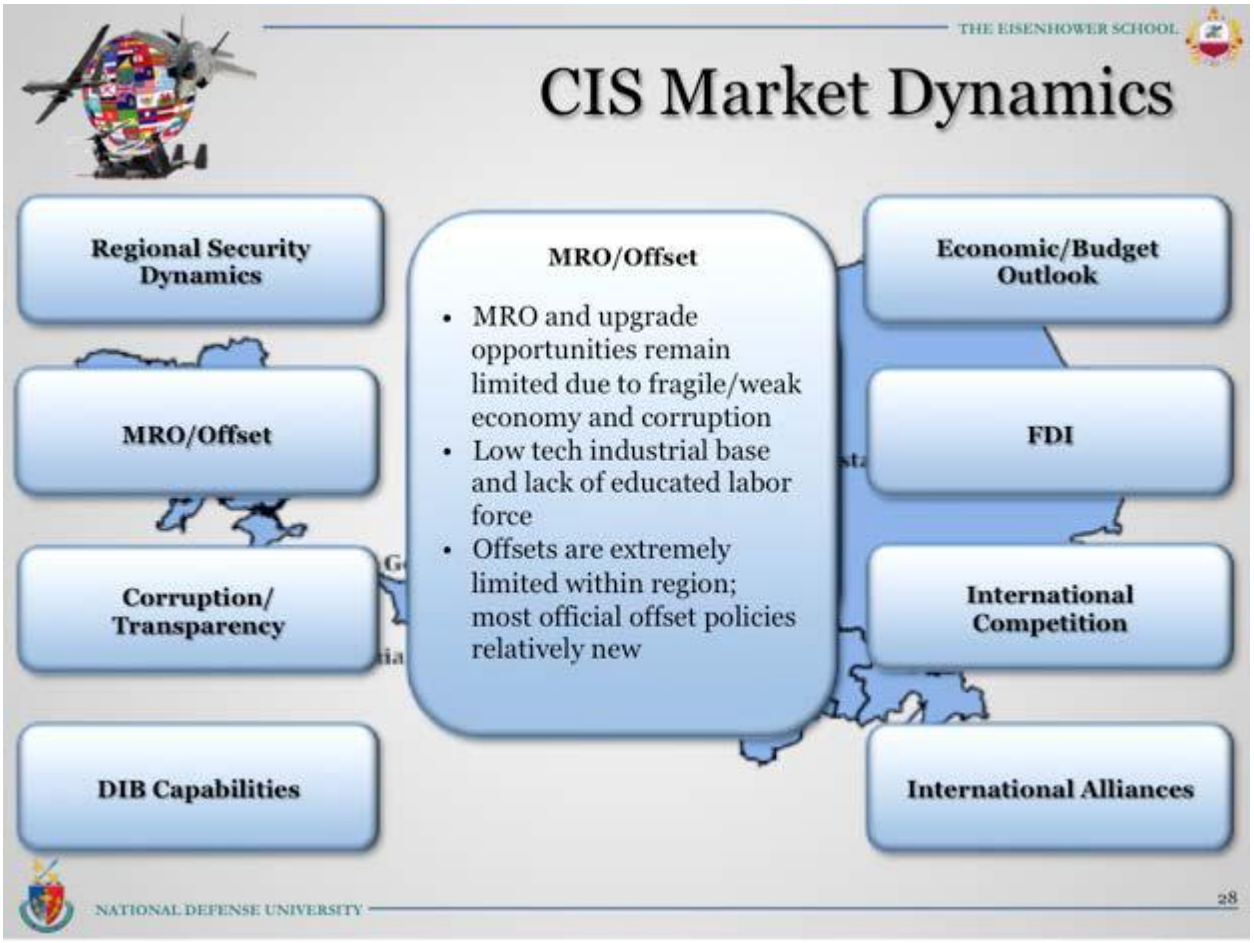
MRO opportunities for UAVs are limited and still yet to be determined. With small and tactical UAVs, the modular design and remove-and-replace concept of this category of UAV will

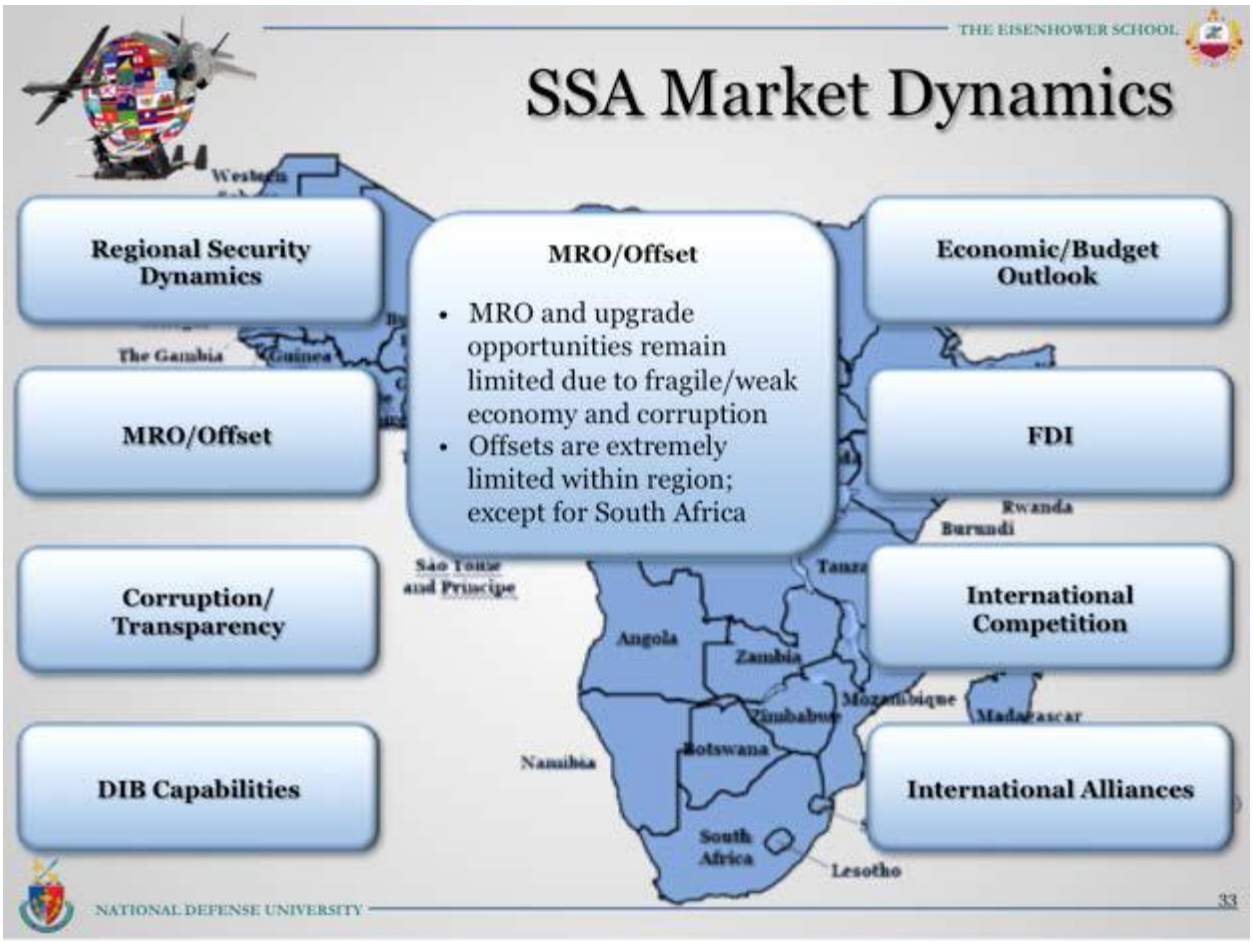
limit MRO opportunities. Brazil's MRO and upgrade budgets remain in other aerospace platforms. Potential opportunities, although not defined, could exist with engines should Brazil acquire a more robust MALE fleet.

Western Hemisphere: Rotorcraft MRO

Most countries in the Western Hemisphere have modest numbers of rotorcraft, many in the single digits. Nevertheless, these markets seem viable candidates for MRO investments as well as the opportunity to provide system upgrades. Because the rotorcraft inventories are generally upwards of 40 years old, upgrade opportunities may offer a thrifty alternative to new procurement. Fortunately, the inventories are almost exclusively from US manufacturers giving them a competitive advantage in contract negotiations as incumbents.

CIS and SSA: MRO





CIS and SSA: Fighter MRO

CIS offers limited opportunities for MRO. Kazakhstan's fleet of Sukhois and MiGs offer Western OEMs no opportunities for MRO. Kyrgyzstan has a small fleet of L-39 Albatrosses, and its poor economic conditions limit paying for MRO – even in the face of active insurgents. Tajikistan also has a few L-39s which assist with Afghan border patrols, but MRO opportunity is limited due to constrained domestic budgets. Ukraine is severely strained by financial pressures and hopelessly outmanned by Russian-supplied (and possibly manned) separatist forces. If Western nations provide fighters when (and if) Ukraine has stabilized, there may be market opportunities for Western OEMs. Uzbekistan relies on Russian support for its weapons systems, and there is no Western opportunity for MRO.

Angola has a non-existent internal military industrial capability and relies on foreign support for their Russian and Brazilian aircraft. Kenya's US fighters are all grounded and offer no options for MRO. Nigeria has a small fleet of Chengdu fighters and currently rely on China for MRO support. However, given that the Obama Administration has reached out to Nigeria to support its fight against terrorist threats and that the nation is expected to see dramatic economic growth, there may be future opportunities for an American OEMs in this emerging country. Finally, South Africa once had indigenous industrial fighter capabilities, but these have declined and its Air Force can barely maintain the JAS-39 Gripens they purchased from Sweden.

CIS and SSA: UAV MRO

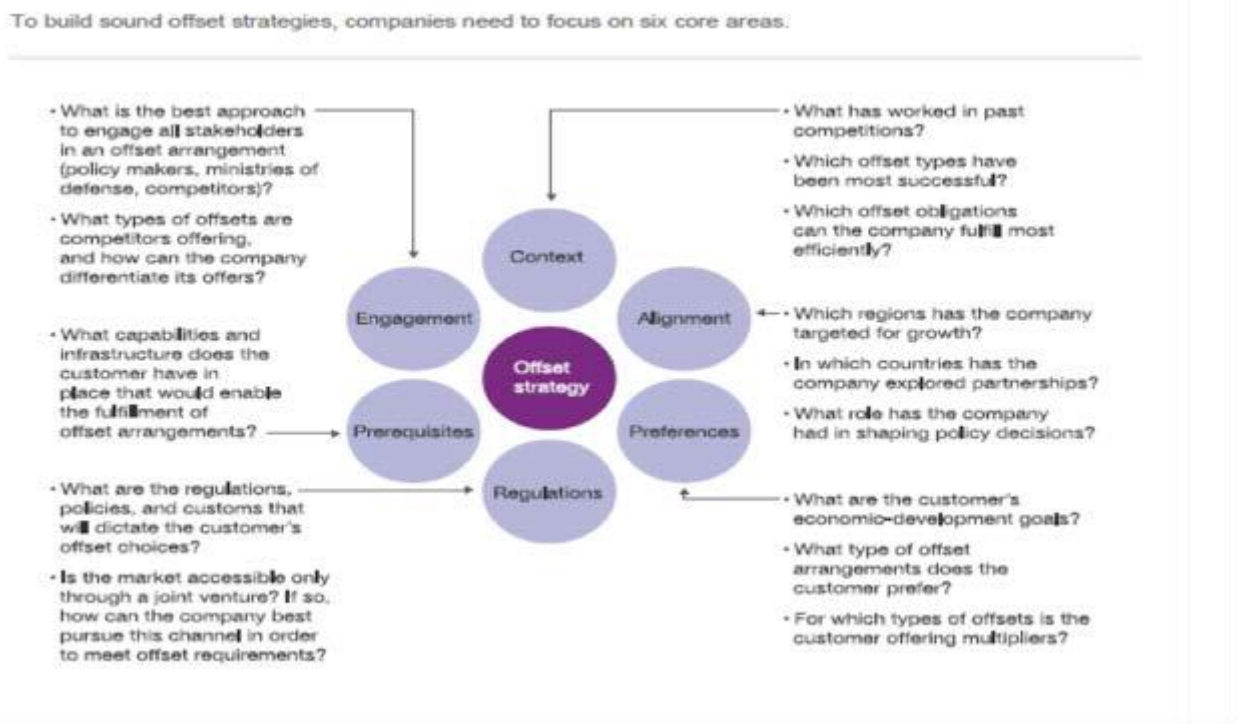
MRO and upgrade opportunities for UAVs are also very limited with regional focus on small, tactical, and MALE categories. Furthermore, MRO/upgrade budgets are spread thin supporting other regional priorities including land and maritime defensive systems. Future MRO opportunities may exist in the Republic of South Africa in support of their growing demand for both domestically produced and imported UAV systems and sensors.

CIS and SSA: Rotorcraft MRO

Opportunities for rotorcraft MRO support from US OEMs in this region are very limited due to the small numbers of helicopters coupled with poor governance and systemic corruption.

OFFSETS

Offset agreements are common trade practices in defense sales and services. There are many different terms for offsets including industrial participation, cooperation, compensation, counter-trade, trade balancing and juste-retour. They are all designed to foster growth in the buyer's local economy and industrial base. Offsets can also be used as powerful barging tool for original equipment manufacturers (OEMs) who are trying to facilitate international sales. Many countries have unique, governing offset regulations and policies. It is incumbent upon OEMs to do the necessary research before embarking on offset agreements. The following diagram, designed by McKinsey & Company, offers a simplified taxonomy for analyzing the benefits and risks of entering into long-term offset commitments.



Offsets Figure 1. Offset Strategy Core Areas for OEMs[8]

Offsets for defense article sales can take the form of direct, indirect or a combination of the two. Direct offsets relate to the sale/purchase of the primary defense article or service while indirect offsets are not specifically tied to the item(s) sold or purchased.

Asia Pacific

Offset policies vary by country in the AP region. They are generally designed to recuperate some of the cost of importing new aircraft and outsourcing modernization/upgrade programs for existing fleets. Offset demands depend on the countries ambitions as well as the sophistication of local DIBs. Offsets can range from counter-trade for less industrialized countries (e.g. Indonesia) to local industrial development and participation thru tech-transfer (e.g. Malaysia). For more advanced industrialized countries - offsets can include local DIB participation in the global supply chains as 2nd and 3rd tier suppliers for the OEMs (e.g. Australia), as well as local licensed fighter production and assembly (e.g. Japan).

Australia does have offset obligations and the program is administered by their Defense Material Organization (DMO). The DMO is an independent agency that is responsible for all Ministry of Defense (MoD) procurements. The value of offsets is negotiable for any contract over $20 million Australian Dollars. FDI is allowed but for larger acquisitions that are greater than AUD$248million, government approval is required.

Japan does not have an official offset policy, however, they seek industrial participation and license production arrangements. Japan could compete for some MRO business with US OEMs due to its significant component manufacturing and skilled production labor force. MRO and licensed production/assembly are the industrial participation centerpieces of Japan's participation in the F-35 program.

Korea has a legal offset requirement that is typically valued at 50% of the contract and is administered separately from FDI. There are significant opportunities for offset purchases of Korean goods and services for US OEMs due to the countries' extensive industrial base. According to IHS Jane's, "while partnerships are considered a prerequisite [for entry into their defense market], [foreign direct] investment is not."

Singapore does not have official offset guidelines, but it does seek industrial participation and collaborative agreements that have the same effect as offsets and generally channel at least 30% of a contract's value to local industry. They have a highly advanced and technically capable workforce that performs high quality work for a reasonable price. FDI is welcome, but not so much in defense industries. Foreign defense firms are however allowed to establish wholly owned subsidiaries in Singapore and hire local talent.

The Philippines have an offset requirement of 50% of the value of contracts over $1M. FDI is highly encouraged with the goal of establishing local entities for transferring technology and skills in order to eventually create their own defense industrial base. The Philippines is a poor country, but has embarked on the path towards a manufacturing-export economy – a model that has proven effective other "Asian Tigers". The Philippines have significant potential to develop their human capital and industry base. However, the country must remain politically stable and their governance needs to keep pace with their economic growth potential.

India's offset schemes are complicated. US firms wanting to compete in India will need local brick and mortar representation in country, with a local faces and local lawyers who know how access to the political bureaucracy needed to navigate the complex process. In the end, Hindustan Aeronautics Limited (HAL) seems to win everything, although the recent purchase of the Boeing P-8 could signal a positive move toward a more open and transparent process.

Middle East and North Africa

Saudi Arabia's offset demands are encapsulated by their program of "Saudisation". This program is designed to transition the country from a consumer of defense equipment to a robust supplier that has the ability to employing Saudi nationals while producing and sustaining domestic defense requirement. The minimum offset quota is set at 35%. However, the Saudi Arabia's offset program has fallen well short of its goals for "Saudisation" due in part to their inability to absorb and build technical and industrial capabilities as well as excessive bureaucracy coupled with a lack of transparency. FDI is highly encouraged in Saudi Arabia as the country struggles to diversify their petroleum based economy.

Turkey's industrial policies reflect their long-term strategic plans to turn defense procurements into defense production and export. This effort has been largely successful, resulting in one of the largest defense industrial bases in the MENA region. There are no legal limitations to foreign ownership of Turkish companies, however joint ventures are a highly encouraged and offset requirements are formulated to shape joint ventures as the most efficient way to invest in Turkish industry while satisfying offsets. As an example, the joint venture between Turkish Aerospace Industries and Alp Aviation Industries partnered with Sikorsky Aircraft Cooperation. This joint venture is considered the model offset program for Turkey, which satisfies offsets for Sikorsky, Lockheed Martin, Boeing and Airbus.

Israel manages very strict offset policies they refer to as "industry cooperation programs". Foreign companies enter a legally binding agreements designed to maximize benefits to Israel through technology transfer, employment of Israeli nationals and for the promotion of Israeli exports. Procurement quotas are set at 50% of the value of the contract. Both direct and indirect offsets are allowed. Israel's industrial cooperation programs have proven very successful and have helped to build a high tech industrial base. The country has a poor record of transparency and intellectual property (IP) protection despite their clear offset policies and an insatiable appetite for "free" high tech defense equipment from the US. Israel has cited security concerns to justify their lack of transparency. They encourage foreign direct investments with no limitations except government approval for investments in defense industries.

Europe

Directive 2009/81/EC is changing the nature of offset agreements in European defense procurement. There is no direct mention of defense offsets in the directive, but it is widely understood that offset arrangements are contrary to open markets. As a result, the directive has served to restrict offset demands across Europe and has effectively eliminated indirect offsets. Instead of offsets, the traditions of "juste-retour" or "fair return" policies are used where participating governments create work share agreements based on the amount invested. This policy allocates work to national firms as part of cooperative procurement programs.

Article 346 of the Treaty on the Functioning of the EU (TFEU) allows countries to exempt defense and security contracts if EU law would undermine their national security concerns. In practice this allows countries to protect specific capabilities. For example, Sweden considers aerospace and submarine technology as protected national capabilities.

The UK had been working on robust offset programs in order to gain technology. They also enjoy large foreign direct investments (FDI) in their defense industrial base (DIB). The UK has been successful with industrial participation programs to include the F-35. They have the potential see a significant return on their investment (ROI) in the F-35 program. The UK is poised to capture over 24% of future global F-35 sales profits through their industrial participation while contributing to only 6% of the program's developmental costs.[9]

In Poland, offsets are ruled by Polish Ministry of Economy. Poland was a vocal opponent to the EU Directive. They want to keep using offsets as an economic and technological tool to help boost their domestic DIB in an effort to catch up with the rest of Western Europe. Thus, Poland delayed adopting 2009/81/EC until 2012. This law was modified in 2014 in order to accommodate Poland's understandable desire to grow their defense industry through offsets.

Italy maintains its own offset program in spite of 2009/81/EC. Italy will eventually have to comply since directives are mandatory for all EU countries. An updated offset policy appeared in 2013 in an effort to force compliance but Italy contends that offsets are a domestic national security issue as allowed by article 346. Indeed, Italy considers offsets as a mean to acquire new technology and boost its defense industry. US OEMs hoping to sell in Italy will need to continue to work closely with Italian industry in order to comply with their current offset policies.

The Netherlands are open to FDI and encourages industrial participation for new acquisition programs in order to support their small but capable Dutch defense industrial base.

The Czech Republic supports principle of the European offset directive. But like Italy, they will invoke article 346 as needed to demand offsets on procurement programs on a case-by-case basis.

Western Hemisphere

Many countries around the world use offsets to grow their industrial base; however, this is a relatively new trend in the Western Hemisphere. In fact, many of the countries in the Western Hemisphere are new to the game. In Canada, offsets are used to develop so-called Key Industrial Capabilities (KIC). The goals of KICs include creating high-value jobs, investing in innovation, intellectual property (IP) transfer, and supporting international businesses. Brazil, Chile, Colombia and Peru mainly use direct offsets to transfer technology and further develop their defense manufacturing capabilities.

Brazil has an evolving offset policy that is meant to increase coordination and flexibility yet still tries to limit FDI, preferring to maintain a majority ownership in joint venture companies within their borders.

Colombian requires a 100% offset quota. The country is seeking further industrial partnerships and alliances yet, ironically, FDI is prohibited in national defense and security industries. Currently, Colombia is engaged in partnerships with Israel, Brazil, South Korea and Spain in an effort to bolster its indigenous industrial capability.

Chile's offset policy was established mainly for the acquisition of F-16s in 2002. Although the offset policy is relatively new, both direct and indirect offsets are allowed. Offsets will be focused on co-production opportunities, tech transfers, and development of new export markets.

Mexico and Argentina do not have formal offset policies; however, in the past, both countries have used counter-trade or "quid pro quo"- type agreements to export natural resources in exchange for military products. Transparency trends mirror corruption. In Canada, a large bureaucratic acquisition process seeks to ensure adequate transparency, which is outpacing the United States. In the south, only Chile boasts high levels of transparency.

Commonwealth of Independent States

Countries in this region are very interested in offsets and FDI to develop local industrial capacity but specific policies and guidance is limited. Regional challenges include significant political and economic instability, widespread corruption, limited transparency, as well as a lack of organic industry and infrastructure. Each of these challenges vary from country to country, but in general, opportunities for US OEMs in the CIS region is very constrained.

Sub-Sahara Africa

The only nation with an official offset policy in Sub-Saharan Africa is South Africa. For contracts above $2 million, South Africa requires a quota of 30-100% with a fulfillment period of seven years. Foreign direct investment is encouraged, but it comes with the requirement of 51 percent South African ownership. Offset agreements will focus on industrial participation, leveraging economic benefits, and promotion of South African industry through defense acquisition. This is driven by the need for economic growth as well as access to new markets and trading partners. South African defense acquisition programs generally target direct offsets to fulfill contractual requirements.

Other SSA countries with some semblance of offset policies include Angola and Nigeria. Angola has required defense offsets in the past for procurements programs from Russian and Brazil. Nigeria has a history of restricting foreign direct investments directly from OEMs. They prefer to deal on a government-to-government level that limits the use of offsets for US companies. Overall, like the CIS region, SSA offers limited opportunities for US OEMs.

Offset Conclusion

Offset arrangements are often complex, costly and difficult to satisfy. However, clearly outlined offset policies provide a framework for firms to develop proposals and negotiate offset arrangements. The recent changes in European offset policy make offset expectations, including consideration during source selection less clear. The expectation of industrial participation may be informal and therefore difficult to assess.

Global competition for military aircraft sales is increasingly complex in part due to offset policies. There is a surplus of international fighter aircraft sellers making it a buyer's market. Therefore, offsets will continue to be an important bargaining tool for US companies who hope to successfully compete in overseas markets. In turn, countries are increasingly seeking to leverage offsets so that they may develop and grow high technology defense industrial capabilities indigenously. OEMs will need to carefully calculate, negotiate, and manage offset promises to ensure they are able to fulfill their commitments without undermining their companies' long-term profits and/or reputation.

IMPLICATIONS AND ASSESSMENT

Changing Market Dynamics

Market opportunities exist for fighters, UAVs and rotorcraft in various regions. However, even with increasing market opportunities in Asia Pacific and the Middle East, those gains may not be enough to offset decreasing US and European markets that have traditionally been lucrative for US OEMs. Along with budgetary realities in international markets, the changing dynamics of offset policies globally are requiring more technologically advanced systems and increased investment in the foreign market through co-development, co-production or joint ventures. These dynamics add further obligations for contract wins that add complexity. These changing market dynamics may require firms to reassess their internal structures and portfolios in order to maintain or change core competencies, human capital and research and development entities. In order for firms to adapt to international market dynamics, consideration must be given to the ways in which domestic, international and perhaps commercial portfolios are balanced.

Changing Business Models

In assessing international market opportunities for fighters, UAVs and rotorcraft, successful firms tend to exhibit four attributes within their business strategies. First, a firm's ability to win in international markets requires a long-term perspective to shift or adapt to market dynamics. In this regard, foresight is required for firms to shift portfolios and internal business structures in order to optimize internal resources and position to win in the market. International sales tend to take years from requirement to procurement to delivery. Successful firms in aircraft markets tend to understand and develop a long-term view of competitive positioning. Second, firms recognize the need and complexities associated with market access. Market entry may mean lower numbers of platforms sold in order to gain positioning within a country. Increasingly, a firm's ability to enter or sustain market share in international markets is directly related to access through market presence, multinational co-development or joint venture partnerships with host nation firms. Next, affordability is a key driver for many international market opportunities. Affordability can be defined as the price associated with the platform plus lifecycles costs plus MRO. More affordable versions of aircraft can be developed as export models, such as the General Atomics Predator XP UAV. Exportable, more affordable, versions of aircraft can be a cost and capability discriminator for US firms seeking international market share. Lastly, firm understanding of the competitive landscape can offer insight to the market dynamics driving international aircraft procurement. US firms not only compete with each other, but with existing and emerging aircraft companies such as Russian, European, Israeli and Chinese firms. While US firms may have a competitive advantage in some technology areas, price and volume may be an advantage for other competitors. Competitors also increasingly place demands on supply chains and MRO constructs.

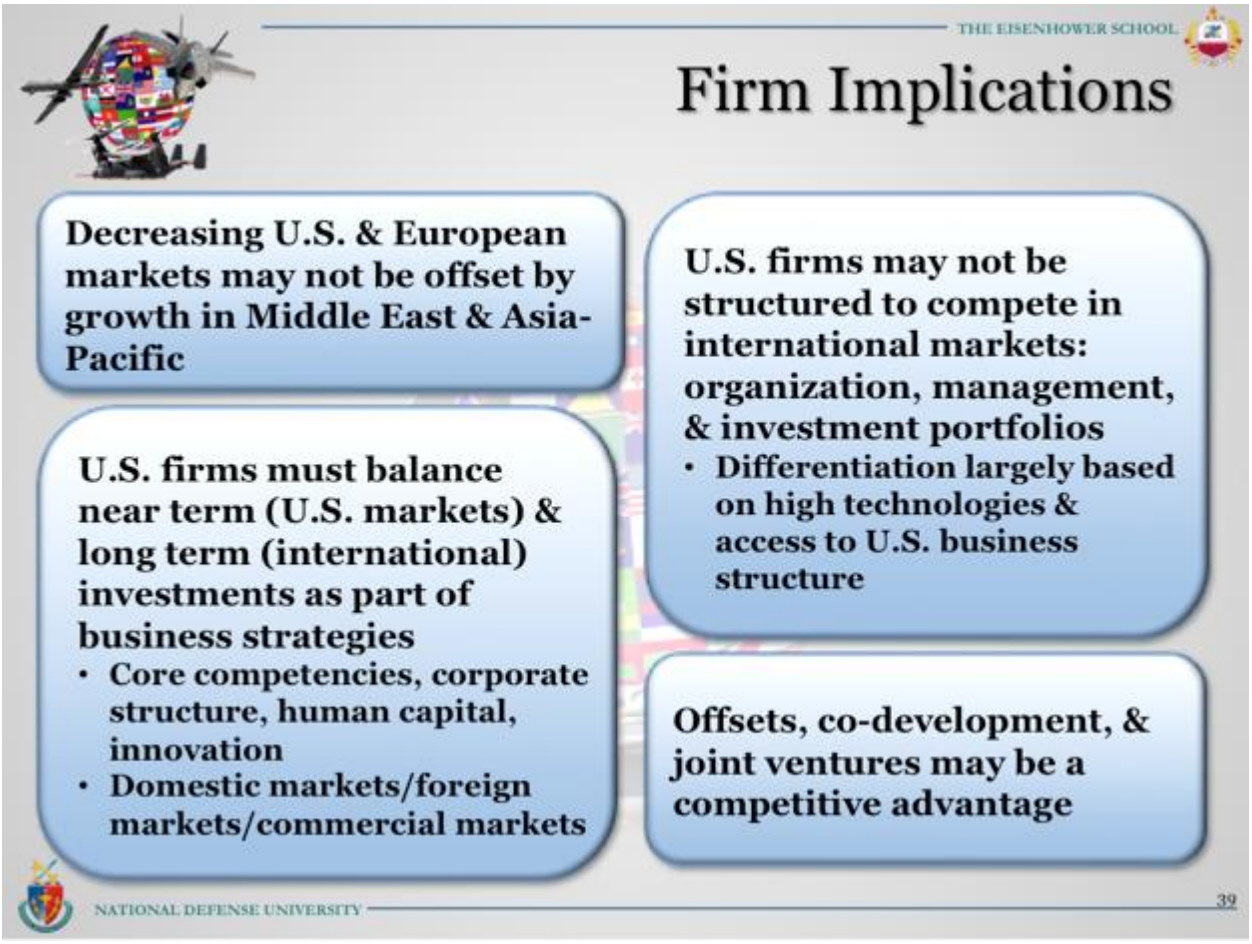
Policy

From a policy perspective, any US firm desiring to sell abroad must still adhere to export controls. For example, US policies and regulations are slowly allowing for increased flexibility to sell UAVs to foreign markets with the introduction of an updated US drone export policy in February 2015. US firms will still comply with existing policies such as the "US Conventional Arms Transfer Policy, the Arms Export Control Act, the Foreign Assistance Act, and the Missile Technology Control Regime (MTCR)… the new export policy promises a faster decision timeline." For more technologically advanced systems, US firm's ability to export will still be highly scrutinized and regulated.

Given that US export policies will still dictate arms sales, the question becomes how will the US government cope or manage increasing market demands for US firms to export aircraft? US policies are beginning to assess the feasibility of cross-pollination of processes in order to export capabilities. According to Beth McCormick, Director of the US Defense Technology Security Administration, "In the future, we're possibly going to see more hybrid-style procurements whereby the platform could go through the DCS route, but a lot of the munitions that are associated with those platforms - particularly with the precision guided systems - those are probably going to go through FMS because we want to ensure the accountability of those weapons systems."

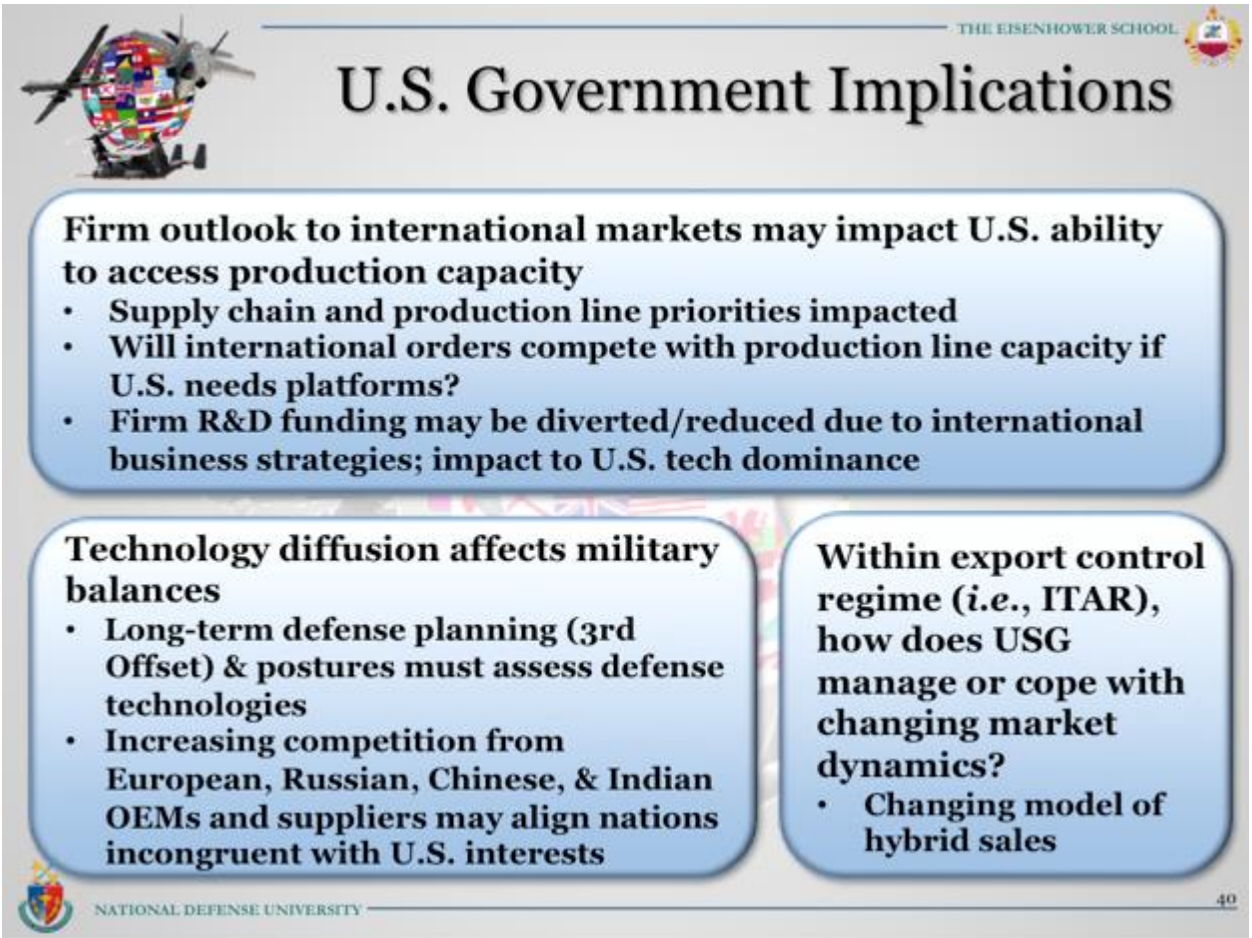
Long-Term Assessment: Capacity

Firms seeking to export aircraft in order to maintain company strategy, production lines and human capital will need to assess their ability to balance domestic and international business opportunities and orders. A question remains: Are US firms at a competitive disadvantage due to portfolio structures, affordability, and access to markets? If aircraft sales increase for international customers, the US government and firms must understand the implications for production line and human capital capacity especially in a surge environment. Furthermore, supply chains may be impacted due to increased orders and delivery of components may be delayed or unfulfilled due to time and capacity. And lastly, if firm strategies are repositioned to cope with increased aircraft sales, the impact to research and development may be diverted due to firm priority. This can lead to an effect of US technological dominance if firm resources are shifting towards increased international orders and the pursuit of additional international markets. The capacity to cope and balance domestic technological requirements in a budget downturn with potential export opportunities must be evaluated from both firm and US government perspectives.



Long-Term Assessment: Military Balances

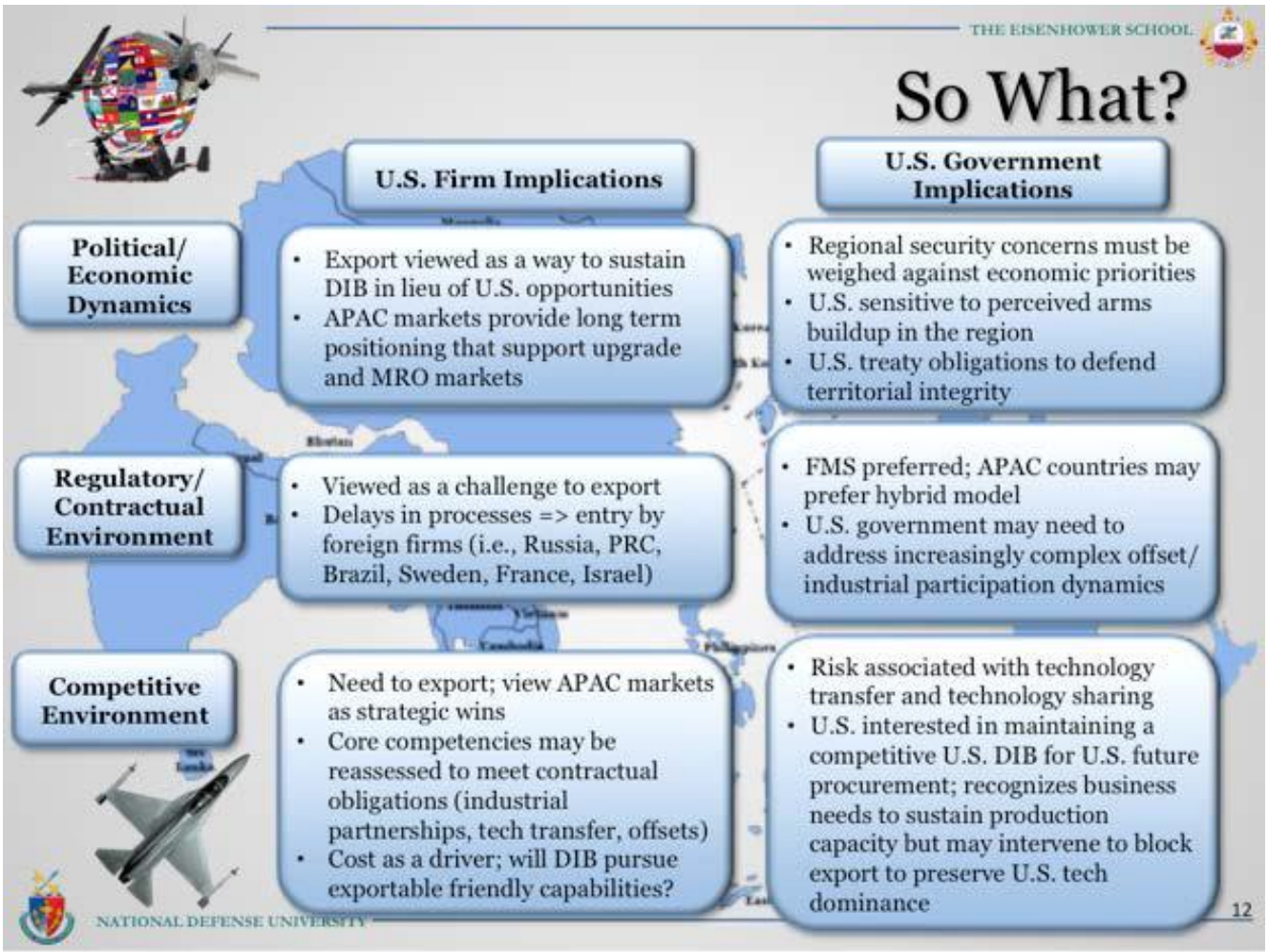
Arms sales and technology diffusion can impact military balances. While the US is engaged in a Third Offset Strategy that seeks to advance particular technologies, long term defense planning must consider the repercussions of exported US weapons systems and technologies. In addition, increasing competition from foreign firms from Russia, China, India, Israel and Europe may provide less expensive and less technologically advanced aircraft to countries of interest to the US. These market dynamics and business models may embroil countries in long term relationships incongruent with US objectives in the country or in the region. Absent a long term strategic construct to ensure the health of the domestic defense industrial base as well as a long term high technology strategy in international regions, US firms and the US government will face increasing competition from overseas firms and countries to shape and influence military balances.



Regional Market Implications

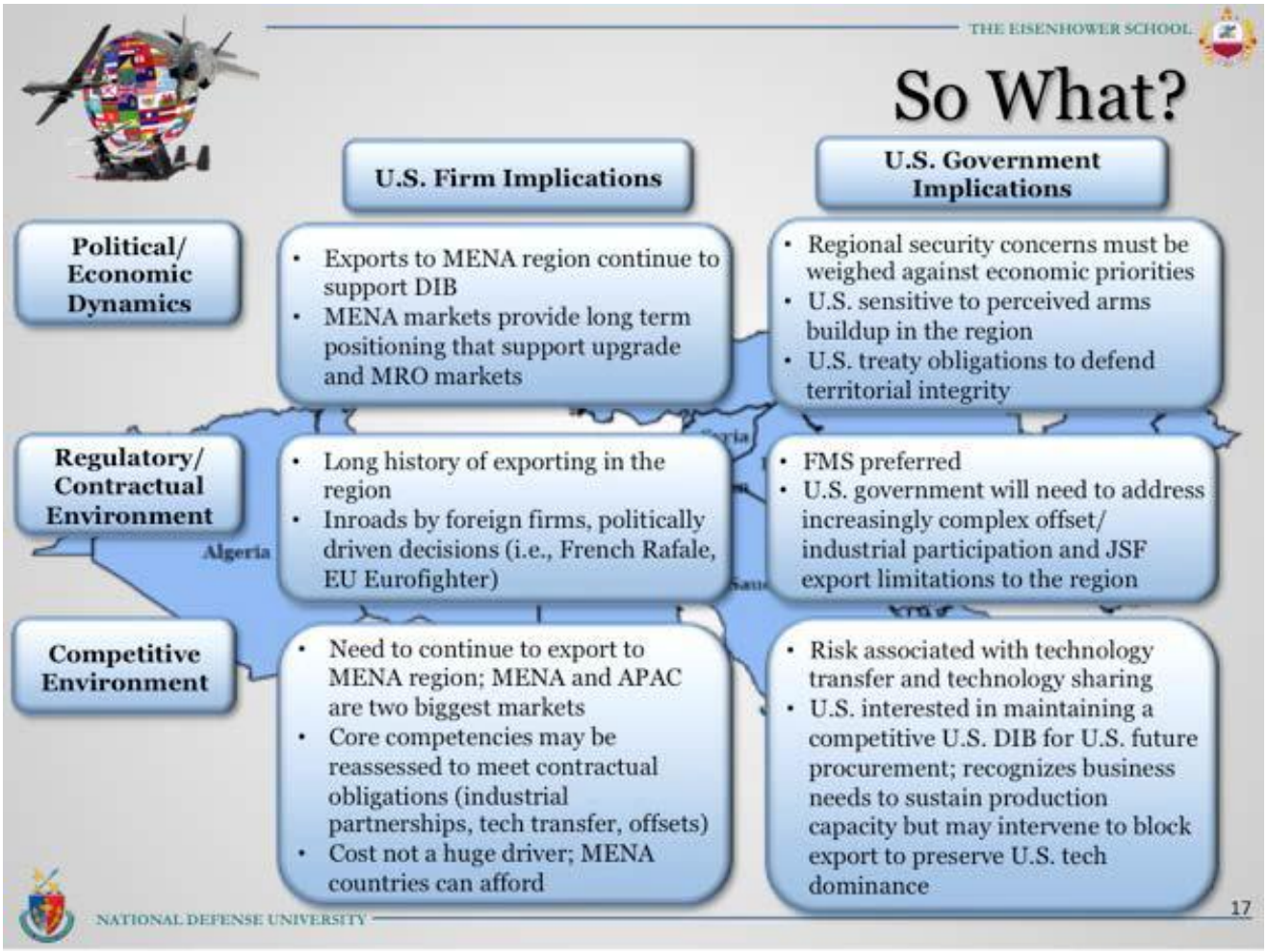
Asia Pacific Market Summary

Asia Pacific aircraft market is an emerging market with significant challenges for business models and strategies.



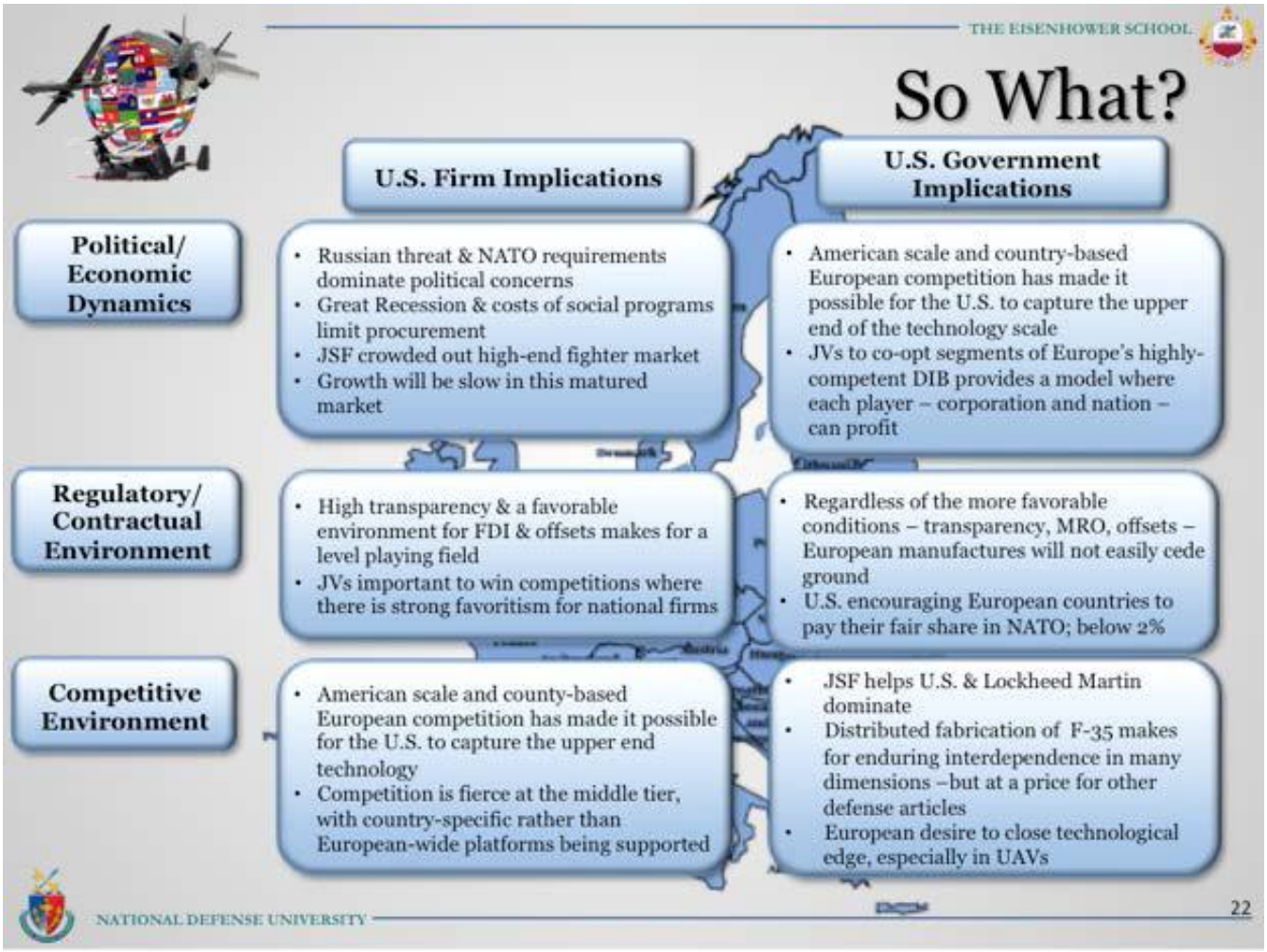
Middle East/North Africa Market Summary

Middle East and North Africa are mostly established markets with continued opportunities for US firms. Interoperability and overcoming export limitations are key factors.



Europe Market Summary

US firms may find Europe becoming a less accessible market due to established and new competitors, shrinking defense budgets, and a preference for European products.

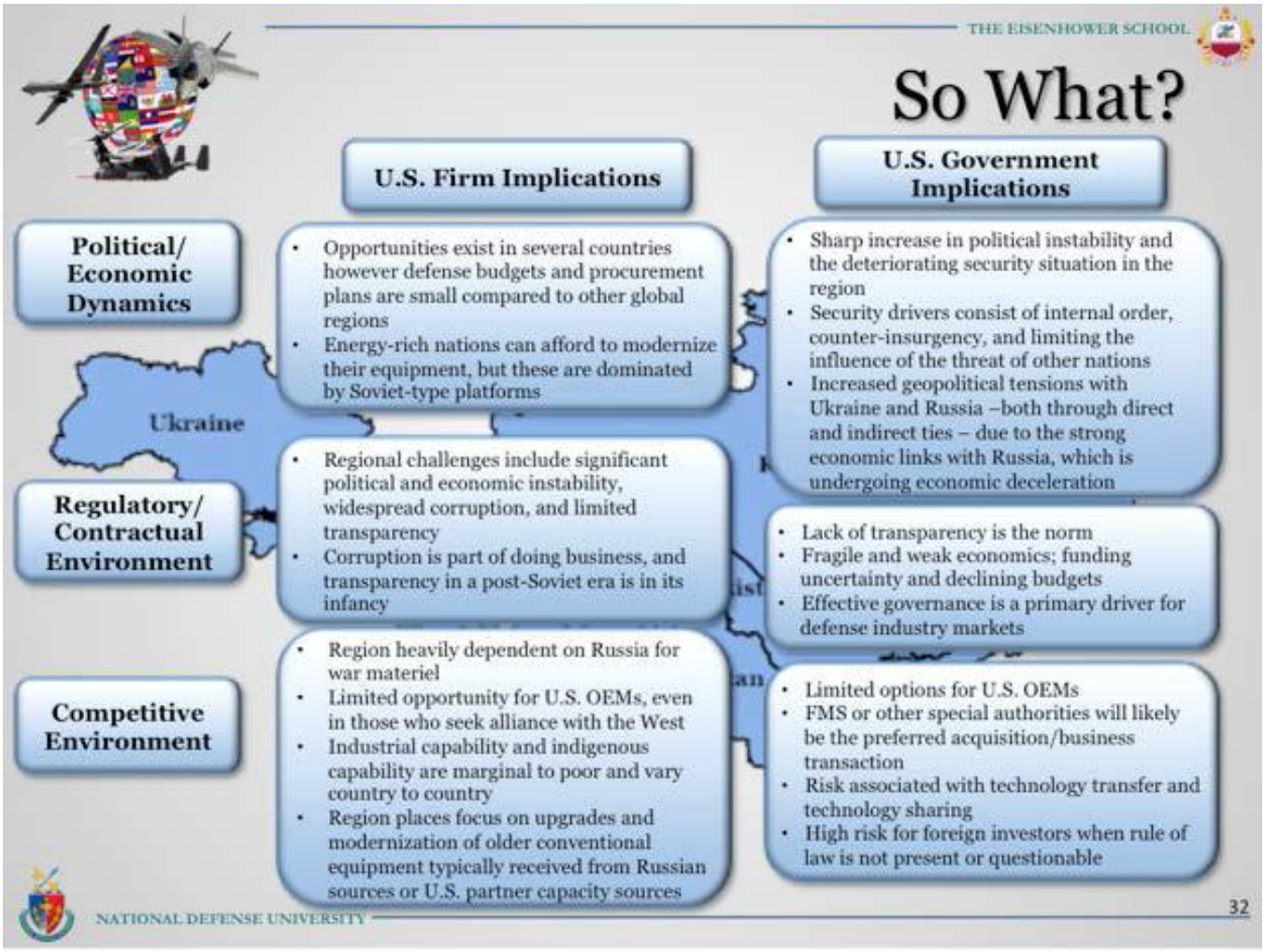


Western Hemisphere Market Summary

US firms should view region as possible revenue source. Cultivation of industrial relationships and legal landscapes within countries may be considered for market entry.

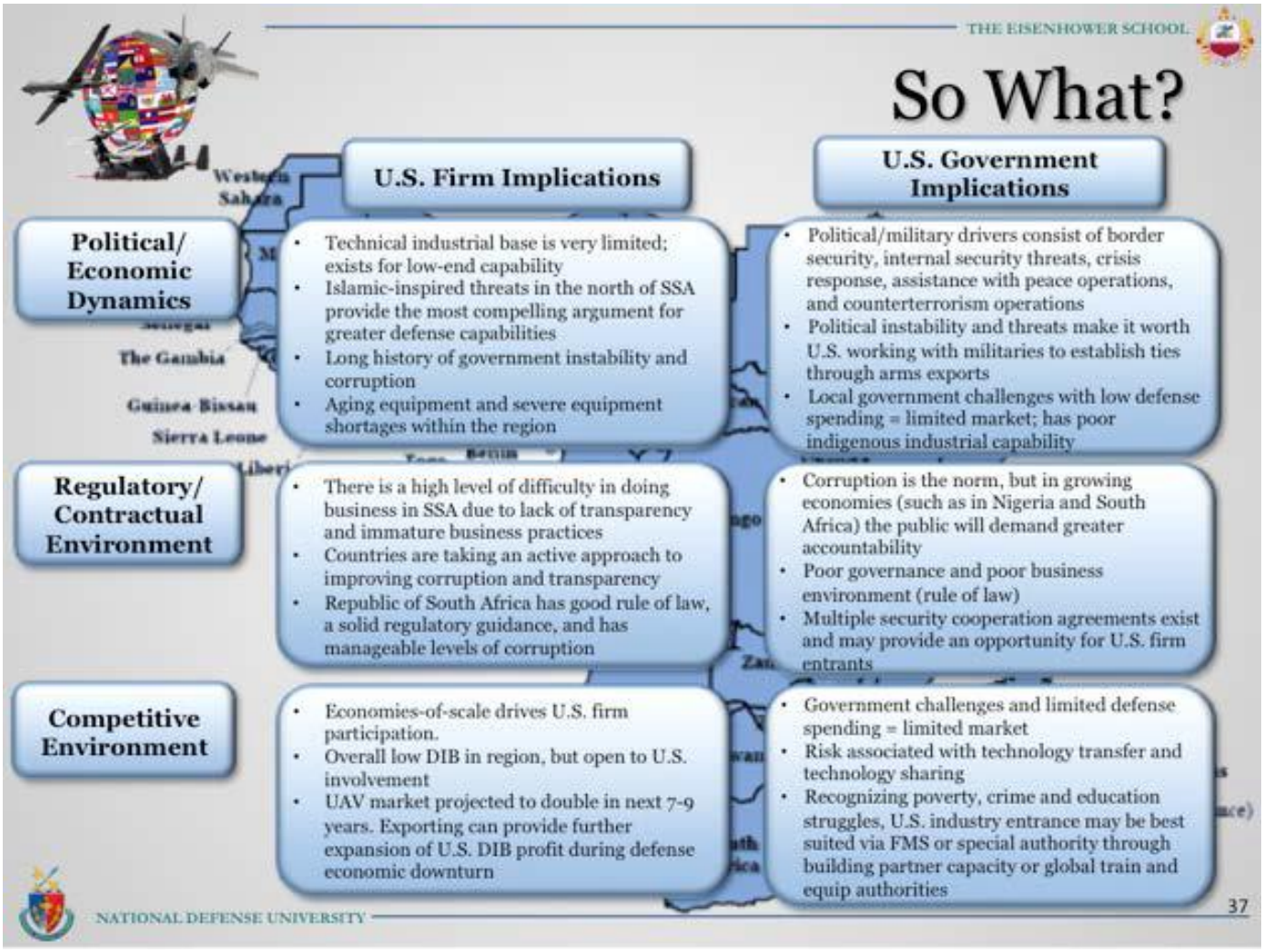
Commonwealth of Independent States Market Summary

Relatively high risk for foreign investments given political, economic and security dynamics presents challenges for market entry due to weak economies and poor indigenous industrial capabilities.



Sub-Saharan Africa Market Summary

Sub-Saharan African industrial capabilities are limited with substantial non-US competition. Overall, this region lacks near-term market opportunities for aircraft.

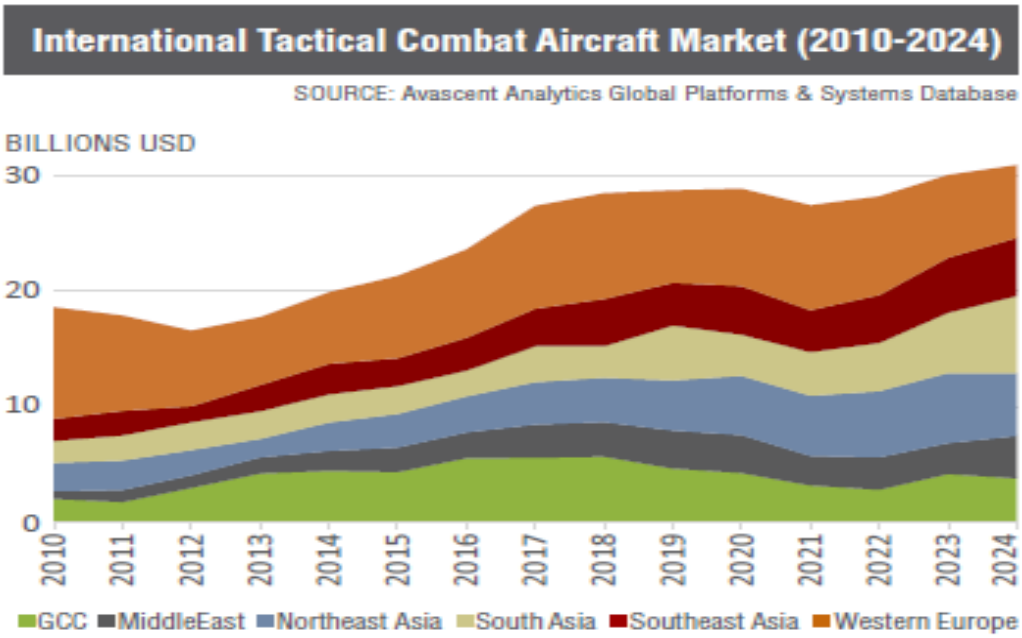


ANALYSIS BY MARKET SEGMENT

Fighter Aircraft: Overall Market Assessment

Established markets in North America and Europe are contracting as markets in Asia and the Middle East are emerging. US and European fighter/attack (F/A) aircraft original equipment manufacturers (OEMs) are being forced to adjust their traditional business models and aggressively pursue international sales as their domestic markets shrink.

The shift to international markets will offer new sales opportunities and challenges for Western F/A OEMs. The predicted growth in global fighter markets over the next ten years is provided by the market analysis firm Avascent.[10]



Countries that desire 4th and 5th generation fighters are challenged by price growth and are structurally potentially unable to sustain those lifecycle costs. The world's air forces meanwhile compete internally with land and sea defense services for finite recapitalization funds. Production and sustainment cost curves must be addressed in order to meet the demand of both domestic and global fighter markets.

The global fighter markets are dynamic and extremely competitive. There are four price categories for international fighter sales according to the market research firm Teal Group:

- $20-35M (low)
- $35-50M (medium)
- $50-65M (high)
- >$65M (very-high)

Currently, the US and European OEMs only offer fighters in the top two price markets where a mere 14 countries currently afford. However, the largest under-serviced market share is in the bottom two price brackets (<$50M) where almost 40 countries have historically purchased fighters.

The F-15s, F-16s and F-18s all first flew in the early to mid-1970s. US OEM's currently lack the ability to effectively compete in the low - medium or even the high priced markets with their costly 1970's style aircraft. Meanwhile the F-35 is in the very high price bracket where it has encountered challenges with developmental delays, cost overruns, performance and sustainment concerns.

US OEMs lack a modern F/A aircraft for one of the largest growth opportunities in fighter sales in the low-medium markets. These markets are currently being aggressively serviced by Russia, Sweden, South Korea, and Brazil firms. Additional, these competitors and others may soon be entering all the market categories (including very-high end 5th Gen). New entrants may include China, Pakistan, India, Turkey and possibly Japan. These emerging countries are all have plans to develop competitively priced, sensor-fused, net-centric next-gen fighters.

In addition to industrial offsets and alliance building, international buyers are looking for reasonably priced, next generation fighters with some level of multi-spectral low observability. The next generation fighters will need open architecture mission system packages that are scalable to fit the saturated export market's needs. Countries want a baseline fighter that they can buy and add capabilities as needed to meet their unique regional security, political and industrial demands. These fighters will need open architecture systems to allow competitively priced (accessible) software and hardware upgrades to existing sensors and weapons systems.

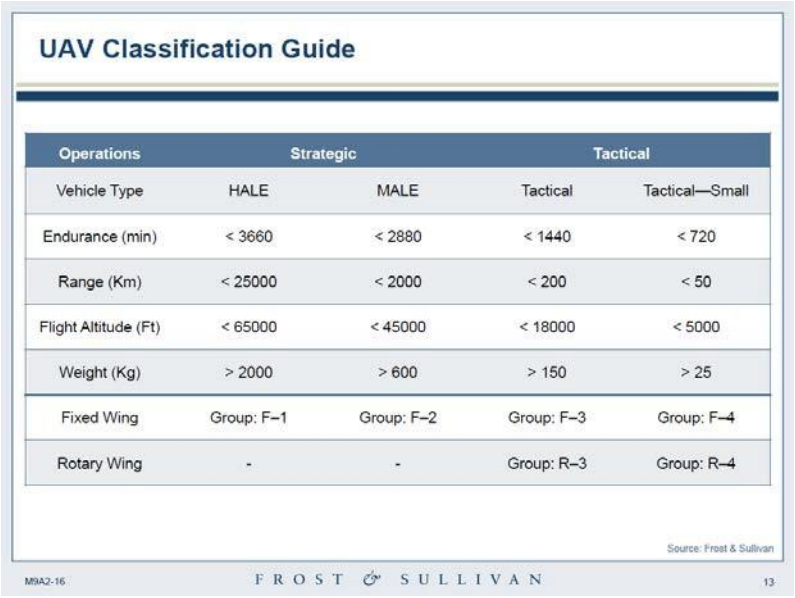
Designing low cost, open architecture fighters will infuse additional competition (& innovation) into the markets and be a huge paradigm shift for US OEMs. These OEMs have historically maintained strict control over all software source code for the purpose of quality control as well as revenue generation. US OEMs have also maintained strict control over any new hardware and weapons systems being mounted on aircraft to preserve their roles as the main system integrators. This paradigm may have to evolve in order remain competitive and innovative while bending the cost curve down. Innovation, and competitive purchase and life cycle costs will allow the DoD and our allies to continue to modernize their fighter fleets in spite of the downward budget pressures on defense spending.

Unmanned Aerial Vehicles: Overall Market Assessment

Military mission areas driving unmanned aerial vehicles (UAV) procurement include Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance (C4ISR), Intelligence, Surveillance, Targeting, Acquisition and Reconnaissance (ISTAR), maritime surveillance, power projection, supporting North Atlantic Treaty Organization (NATO) missions, and littoral and border security. Contingency operations in Afghanistan and North Africa have driven recent procurement of a range of fixed-wing UAV types for C4ISR and counter-terrorism mission support. Concerns of illegal immigration coming from Africa into Southern Europe have also driven recent procurement of UAVs capable of maritime domain awareness and littoral surveillance.

UAVs can be broadly characterized as indicated in the below chart. The category of UAV procurement is driven by mission needs. Small- tactical UAVs are typically used as organic support for ground maneuver and infantry forces involved in contingency operations. Small or Tactical UAVs are typically launched by human power and recovered by controlled flight into the terrain. Tactical UAVs are larger, more capable, and require assisted launch and recovery

equipment. These are typically launched by mechanical catapult systems and recovered with netting or lines in order to prevent damage from a collision with the terrain. For ground forces these systems are typically used at a regimental level, but they are ideally suited for shipboard use where flight deck space is nonexistent or limited to a helicopter pad size are. Medium Altitude Long Endurance (MALE) UAVs are the most versatile and support a variety of missions including C4ISR, ISTAR, power projection and special-operations. MALE systems require runways for launch and recovery. They also carry increasingly integrated precision air-to-ground weapons and sensors that can operate across a variety of spectrums to generate precision targeting and strike data. High Altitude Long Endurance (HALE) systems support broad area C4ISR needs and offer the prospect of rapid mobility as self-deploying platforms. They are capital assets and their use will typically be controlled at the theater commander level. They are the most sophisticated, largest, and most expensive UAVs, often costing more than a 4+ generation strike fighter. Vertical Take Off and Landing (VTOL) UAVs typically support maritime operations but compete on range, speed, endurance, payload, and performance characteristics against small-tactical systems that can be catapult launched from the same deck space. Finally, there are Unmanned Combat Air Vehicles (UCAVs). A UCAV is an armed UAV and is typically a higher end MALE or a dedicated HALE class UAV that is purpose designed for a long range penetrating strike capability.



UAV Classification Guide

Operations	Strategic		Tactical	
Vehicle Type	HALE	MALE	Tactical	Tactical—Small
Endurance (min)	< 3660	< 2880	< 1440	< 720
Range (Km)	< 25000	< 2000	< 200	< 50
Flight Altitude (Ft)	< 65000	< 45000	< 18000	< 5000
Weight (Kg)	> 2000	> 600	> 150	> 25
Fixed Wing	Group: F–1	Group: F–2	Group: F–3	Group: F–4
Rotary Wing	-	-	Group: R–3	Group: R–4

Source: Frost & Sullivan

UAVs can also be characterized by price category. Small and medium tactical UAVs are the least expensive, ranging in cost from $50K-$4M. MALE UAVs are significantly more expensive, ranging in price from $9-$20M for complete systems including multiple air vehicles, ground control stations and other components. HALE systems are at the upper end of the price spectrum, ranging from $75M to $115M for complete systems. Finally, VTOL UAVs range in price from $8M-$15M.[11]

The technological leadership of US firms in the UAV arena may provide the necessary advantage to enter Asian and European markets. Indigenous defense firms are currently not able to satisfy MALE and HALE UAV requirements and there is concerted effort to close capability gaps with US and Israeli firms. Cooperative ventures between US and foreign firms could allow managed technology transfer benefiting foreign firms while allowing US firms access to key markets.

In smaller UAV markets such MENA, CIS and Sub-Saharan Africa, UAVs may provide an entry to defense markets through traditional export regimes as well as potential joint venture or host nation industrial participation constructs. US firms might consider initial low yield UAV acquisitions from these markets that could serve to secure market presence and potential future business. Small UAV sales may compliment future US business in manned aircraft, land or maritime systems.

These partnerships and alliances can create supplier relationships where different US OEMs partner with corresponding competitors in the foreign market. Once a supply chain is established, the cost of substitution tends to be high, which can lead to interdependencies that last well beyond the originally intended purpose. This can also lead to, and is often an intended by-product, technology diffusion as partnering countries wish to advance their own aerospace industrial capabilities to move up the value chain.

There is growing interest in leasing arrangements for UAV/ISR systems to meet short term ISR needs. There are a variety of possible leasing structures ranging from companies providing UAV platform time by the hour through militaries independently operating and maintaining leased UAVs. These flexible approaches could be a government owned/contractor operated or GOCO approach, contractor owned/government operated or COGO strategy, or contractor owned/contractor operated or COCO agreement.

Leasing arrangements offer low cost access to UAV capabilities in the near term while longer-term force structure and requirements are developed. These flexible business relationships may best suite a country with limited human capital, limited investment resources, or ability to maintain UAV systems. Firms offering lease arrangements can generate revenue with existing aircraft and also provide an indirect market for new aircraft production.

US policies and regulations are slowly allowing for increased flexibility to sell UAVs to foreign markets with the introduction of an updated US drone export policy in February 2015. For more technologically advanced MALE and HALE systems, US firm's ability to export will still be highly scrutinized and regulated. These regulations also seek to restrict the use of UAVs for intelligence gathering purposes or limited strike capabilities.

US policies are beginning to assess the feasibility of cross-pollination of processes in order to export capabilities. According to Beth McCormick, Director of the US Defense Technology Security Administration, "In the future, we're possibly going to see more hybrid-style procurements whereby the platform could go through the DCS route, but a lot of the munitions that are associated with those platforms are probably going to go through FMS to ensure the accountability of those weapons systems."[12] This could provide a means for more advanced UAV systems to enter foreign markets while still adhering to MTCR requirements. While the regulatory landscape is slowly changing it remains a concern for industrial partnerships due to limiting possible future export of jointly developed systems.

MRO opportunities are limited due to the wide variety of UAV systems in use, the lack of geographic or type concentration and small size of many UAVs in use. Over time there will likely be more type concentration of larger UAVs such as the General Atomics MQ-9 Reaper which is now operated by a number of European militaries. As that concentration occurs regional MRO opportunities will likely begin to develop. Additionally, UAVs are modular systems offering significant upgrade opportunities, particularly in the avionics, sensors and ground control station segments. Since the preponderance of UAVs operated in by MENA countries are tactical assets, their MRO needs do not necessarily warrant upkeep or upgrades outside of stated ad hoc structure.

Small/medium tactical UAVs have broader appeal to militaries with smaller defense budgets and focused missions. The market for MALE and HALE UAV systems is limited to countries with larger defense budgets or pooled procurement. For the foreseeable future MALE

UAVs will be workhorse systems for militaries that can afford them. They have demonstrated value, serve multiple missions and can be continually developed to enhance capabilities. These systems represent the largest projected UAV market segment by value over the next decade. This segment will also become more competitive as European firms attempt to close capability gaps with US and Israeli offerings to meet European military requirements.

The future roles of HALE UAVs and UCAVs are not entirely clear. There are a number of European technology demonstration and UCAV feasibility studies underway. It is not yet clear what combination of autonomy, weapons and sensor carriage and low observable design will fit future European UCAV requirements. HALE UAV systems have demonstrated utility providing persistent surveillance but given their high cost the right mix of HALE and UCAV capabilities must be determined before further investment is made in developing new systems.

The global UAV market is large and growing. US firms are well positioned to compete in all segments of the UAV market. Along with Israeli firms, US firms offer the most capable MALE and HALE UAV systems as well as a variety of tactical and VTOL UAVs. Competing in the regional defense market requires more than technological leadership. Understanding regional defense market dynamics and meeting expectations for offsets, local participation and technology transfer is also required. US firms that are able to satisfy both military and political requirements should compete well in regional UAV markets.

Rotorcraft: Overall Market Assessment

International helicopter markets are characterized by countries looking to modernize aging fleets and are a relatively untapped opportunity for US rotorcraft OEMs. However, these opportunities are limited and US OEMs cannot expect the large number of airframes they are accustomed to with developed nations, but are still solid market opportunities that may result in regional opportunities where greater numbers and MRO service contracts can be secured. As mentioned above, US designed and built aircraft already have a good global footing and represent the highest helicopter standard available, albeit at a price of high standard helicopter as well. Countries also often look to US produced aircraft to ensure interoperability with US and US allies as well as the potential security cooperation benefits of US contracts. Also, helicopters are positioned well to solve some of the range, operational and security issues nations are facing in these regions. These nations face regional threats across borders, terrorism, illicit drug trade, civil unrest threatening government, humanitarian relief needs during times of crisis, maritime patrol responsibilities and the need to provide direct support to their ground combat troops all drive a need for helicopters. Unfortunately, helicopters must also compete within a nation's complete set of defense priorities. Fighters are more expensive but are prestige weapons prized by many nations and sometimes purchased more for political reasons than for physical application of this resource. UASs are a simple and economic way to accomplish several missions. Helicopters, while a much need asset are not as fast, powerful and able to project force at great distances like jet fighters and are not economic or simple like UAVs.

Another challenge for US helicopter OEMs in international markets is the growing complexity of each country's offset requirements, joint venture requirements and industrial cooperation requirements. While the majority of foreign sales are still completed through FMS or DMS, a growing number of nations require offsets aimed at growing their own defense industrial base or in some cases require aircraft be built domestically through a joint venture or industrial cooperation agreement. While the degree of complexity in these deals is high and the profit margins lower, these agreements represent the future of aircraft procurements for countries with

the ability to absorb the technical and industrial capacity to produce these aircraft while increasing their domestic economy, developing their human capital, growing their industrial base and increasing their self-sufficiency. US rotorcraft OEMs also cannot afford to ignore or discount the existing and emerging economies represented in some of the individual countries and market regions, some of which that were less affected by recent economic downturns. These emerging nations also have emerging militaries driving the need for rotorcraft that may not have previously existed.

While there are solid opportunities in international markets for US rotorcraft OEMs they face significant challenges. Sikorsky and Bell are late to the international market and do not have the infrastructure and supply chains. Boeing has been an international company for decades but only recently began international rotorcraft sales. US OEM business models for military rotorcraft are not ideally suited to compete in the international market favoring FMS or DMS. US helicopter OEMs may face difficulty with offset requirements, joint ventures and industrial cooperation requirements.

US designed and produced helicopters are also expensive and very advanced with limited scalable options to meet specific needs or meet ITAR requirements. The majority of US designed helicopters are also mission specific into attack, utility and cargo, missing a market opportunity to provide a single platform, multi role helicopter or family of helicopters able to perform several missions and support maintenance and parts commonality. Lack of scalability also leads to lack of midlife upgrades for avionics mission systems, power plants and drive trains instead requiring aircraft replacement often with new models of existing platforms. US OEMs must also understand and successfully navigate markets in countries looking for a "whole-of-government" approach to buying military equipment. OEMs need to develop the skills and relationships in order to work in concert with the host nation and the USG while still supporting helicopter procurements and MRO operations.

Of the regions studied, the following represent the greatest rotorcraft market opportunities for US OEMs. In order they are: Asia Pacific, Europe, Middle East North Africa, Western Hemisphere, Commonwealth of Independent States and finally Sub Saharan Africa.

APPENDIX A: FIGHTER AIRCRAFT BY REGION

The following sections will analyze the international regional markets for fighters in more detail. The key market growth opportunities for US OEMs in the short term will be the Middle East, led by Saudi Arabia and their recent F-15SA purchase along with the Southeast Asia region that is forecast to overtake MENA in F/A aircraft spending by 2020.

Asia Pacific: Introduction

Global weapons producers recognize the increasing market opportunities in the Asia Pacific region. Economic growth coupled with growing regional security challenges is fueling the demand for advanced weapons systems including fighter aircraft. Fighter producers from around the world have traditionally relied on domestic markets but are now aggressively pursuing international sales to supplement their domestic post-Cold War defense spending downturns. American fighter original equipment manufacturers (OEMs) are also relying more on exports due to shrinking budgets and less frequent Department of Defense (DoD) acquisition programs. Even combat proven fighters like the F-15s and F-16s have not been immune to the downturn. These two programs now rely solely on exports in order to keep their current production lines open. New entrants are also pushing into the fighter markets from China and South Korea, giving countries expanded choices and creating even more competition for global sales.

Market Opportunities

Lockheed Martin's Joint Strike Fighter (JSF) is expected capture the majority of the regional market over the next 10 years and beyond. Japan, Australia, and ROK are all planning to purchase F-35s. Japan has ordered 4 Lightening II's with an option to buy 38 more for local assembly. Access to technology and mission systems source codes will be an important part of future sales in Japan.

Australia

Australia is planning to spend AUD17B on 72 F-35As over the next 10 years in three phases but delays in the program along with a recent economic downturn may curtail the order. Australia's fleet of 24 new F-18E/Fs and plans to purchase an additional 12 EA-18Gs will also compete for the limited acquisition and operations and maintenance (O&M) dollars in this country with a population of only 22 million.

Republic of Korea

The Republic of Korea (ROK) intends to purchase 40 F-35As for $7B while simultaneously designing an indigenous next generation fighter - designated the KF-X. This program will also compete for the same acquisition funds as the F-35.

Singapore

Singapore is the only other AP nation currently able to purchase the high-end JSF as a possible replacement for their aging F-16 and F-5 fleets. They have delayed the decision while they complete the purchase of 40 Boeing F-15SGs and upgrade 60 F-16s.[13]

Malaysia

Malaysia has plans to replace their retiring MiG-29 fleet. They are evaluating the purchase of new Fulcrums as well as F-18s, Eurofighters, and French Rafales - but Saab is offering a lease-to-purchase option for up to 24 JAS-39 Gripens along with 2 S-340 airborne early warning and control (AEW&C) aircraft. This packaged lease offer may give the Swedish company a competitive edge in Malaysia due to the countries limited defense procurement budget of $1B annually.[14]

Taiwan

Taiwan has expressed interest in buying up to 66 new F-16Cs but diplomatic pressure from China will likely continue to block support for future US new fighter aircraft sales to Taiwan.

Rest of Asia Pacific

There are several other AP market opportunities with some of the less affluent regional countries, even though US OEMs lack a low-cost, scalable export fighter. However, the lack of a low cost fighter will limit their new aircraft sales to these more cost sensitive nations. LM in particular has some opportunities to facilitate sales and offer upgrades for "gently-used" surplus F-16s. Indonesia is a good example as they are considering adding to the 24 refurbished F-16s they purchased in 2011 from the USAF for only $750M. They have also expressed interest more modern F-15s or F-18s as well as plans to buy up to 180 Russian Sukhoi Su-35s by 2025 but domestic budgets will limit their ambitions.[15]

Indigenous Fighter/Attack Aircraft Industrial Capabilities

Japan, South Korea, Taiwan, Australia, and Singapore all have technologically advanced industrial capabilities that provide varying support for their fighter aircraft programs. Japan developed their F-2 jointly with LM in the 1990s. The program had planned to build 130 aircraft but only 90 F-2s were produced between 2000 and 2011. The single-engine fighter ended up costing almost 3 times more than the F-16 and is arguably less capable. Japan's Mitsubishi Advanced Technology Demonstrator-X (ATD-X) recently emerged. It was developed as an indigenous fighter for testing advanced stealth and 5th generation technologies. The ATD-X is scheduled to fly sometime this year. Japan will continue to develop this next generation domestic fighter while simultaneously purchasing F-35s – most likely for the technology transfer. They are also constructing a regional F-35 final assembly and check out (FACO) facility where Mitsubishi will assemble future 5th generation aircraft – possibly including their indigenous ATD-X. The FACO facility will further serve as a regional MRO hub for the F-35 program.[16]

South Korea is pursuing an indigenous next-generation fighter as well with their KF-X program. The effort has a great deal of local political support. The country hopes the program

will generate increased domestic industrial capability while keeping their tax dollars at home as ROK replaces their aging F-4 and F-5 fleets with up to 250 new KF-X fighters. The KF-X will also be designed for export markets – with hopes of replicating the success of Korean Aerospace Industry's (KAI) T-50 Golden Eagle program.

Taiwan developed an Indigenous Defense Fighter (IDF) in the late 1980s to replace their aging F-5 fleets. They had planned to build up to 420 IDFs however the last of the 121 aircraft produced was delivered in 2000. Taiwan has since became overly reliant on US exports and allowed their aircraft industry to atrophy. They may now be force to revitalize their organic fighter production due to USG export restrictions - and, no other export countries are willing to defy China by selling fighters to the disputed island nation.

Australia and Singapore do not possess, nor do they plan to develop the sophisticated aircraft industrial base necessary to design, develop, and build indigenous fighters. These two countries are content for now to import fighters while relying on their organic capabilities to provide MRO as well as produce aero-structures, components, and engines as needed to support their respective fighter programs. These advanced domestic industries are supported by a well-educated, skilled, and motivated workforce in both Australia and Singapore. Of note, Singapore currently provides MRO support for US fighter in the region and Australia has been selected as the primary F-35 MRO and upgrade (MRO&U) for the southern Pacific while Japan will be responsible for the northern Pacific. Although Australia is the only F-35 customer in the south Pacific (so far), they are expecting to get additional MRO&U business from forward deployed US units to help offset their infrastructure investments.[17]

Reliance on Imports & Company Incumbents

All AP countries rely on imports to fully meet their domestic fighter/attack aircraft needs. Even countries with advanced industrial capabilities like Japan, ROK, Australia, Singapore, and Taiwan rely on imports. These countries are aligned with the US and depend heavily on Boeing and LM for high-end support for technology, materials, skills, and knowledge.

Many countries in Southeast Asia are less geopolitically aligned and rely on a variety of suppliers from the US, Western Europe, China, and Russia. For example, Indonesia has a mix of fighters and attack aircraft including F-16s from America, Su-27 and MiG-29's from Russia, Hawks from the United Kingdom's (UK) British Aerospace (BAE), and EMB-314 Super Tacanos from Brazil. Indonesia also has a 20% partnership in the development and production of South Korea's next generation KF-X fighter. Malaysia is another example of a non-aligned APAC country that relies on a mix of imported fighters from the US (Boeing), Russia (Sukhoi and Mikoyan), as well as from the UK (BAE). Malaysia is also considering replacing their MiG's with JAS-39 Gripens from Sweden.[18]

Drivers of Industrial Alliances

AP countries are all interested in getting the very best fighter/attack aircraft (for the right price) to meet their evolving security needs. These countries are also driven by a desire to improve their industrial bases as well as develop organic human capital in order to cultivate their knowledge based societies and compete in the globalized economy. Industrial alliances are therefore formed to help achieve a country or an industries long-term economic objectives.

Interdependencies Created with Firm Competitions

Interdependencies already exist in the high-end (>$50M) AP markets where Boeing and LM compete. These countries include Japan, Australia, South Korea, and Singapore. They are all some of Boeing and LMs best international customers who value the traditionally strong geopolitical, economic and security ties with the United States.

These four AP countries have been loyal Boeing and Lockheed customers for decades but are beginning to lean more heavily toward LM and its "winner-take-all" F-35 Joint Strike Fighter (JSF) program. The JSF was designed for a US based OEM to capture the majority of sales within the global fighter markets. It has been a joint and international program from its inception in the early 1990s. Countries are drawn to the JSF with promises of access to 5th generation fighter technology, domestic industrial participation in the global supply chains, and implicit/explicit long-term security alliances with the United States. No matter how dominate the F-35 may become, competition for fighter sales between Boeing and LM in the Pacific region will continue for at least another ~5 years.

Boeing's best strategy to remain relevant in the region will include aggressively marketing its' EA-18G as a force multiplier for the F-35 in anti-access/area denial (A2/AD) environments. The company should also aggressively purse development of their clean-sheet USAF T-X aircraft in partnership with Saab. This aircraft could capture future training markets - while a weaponized F/A version could compete as a low-cost ($20-$35M) F-5 replacement in Asia. Boeing's T-X program will be key to keeping their tactical aircraft assembly lines open until the 6th generation fighter production begins (assuming they win both competitions).

Lockheed Martin is in a much better long-term competitive position in the AP region. They already have a share of the successful low-cost exportable T-50 through their joint venture with Korean Aerospace Industries (KAI). They are also teaming with KAI on Korea's next generation KF-X developmental program. The KF-X has the potential to be a successful replacement for the F-16 as an export fighter in medium-cost ($35-$50M) markets. In the meantime, LM can continue to offer upgrades and modernization packages to their venerable F-16 fleets. These efforts will solidify interdependencies while fostering indigenous industrial capacity in some of the less developed, less affluent AP countries. This growth will produce spinoff technologies and human capital that will facilitate economic growth throughout these developing countries. That growth will translate into higher domestic GDP and more discretionary defense spending - which should result in greater market opportunities for LM's F-35 over its projected 50+ year life cycle.

Conclusion

Economic indicators predict continued downward pressure on discretionary domestic defense spending in most advanced industrialized countries – including the United States. Global fighter OEMs will all be aggressively pursuing international sales in emerging markets in order to offset slumping domestic budgets. AP is a developing market where defense spending is forecast to continue to slowly increase over the next 10 years but competition in the high-end (>$50M) fighter/attack market will be intense due to an abundance of international OEMs competing in this market segment. Fighter OEMs like Boeing and Lockheed Martin will be competing for new fighter sales in a handful of more affluent AP countries against seasoned and aggressive OEMs from Europe and Russia. US OEMs will also have to deal with growing competition in the fighter markets from emerging OEMs in South Korea, India, Turkey, Brazil and China. These emerging fighter producers may offer better value and more technology transfer with less restrictions and fewer geopolitical strings attached. In reality, US OEMs have already captured the bulk of the

exclusive high-end market in AP for next 10+ years.

Boeing has completed all 60 F-15K deliveries to Korea as well as the 40 F-15SGs to Singapore with no additional regional orders on their books. Boeing's sale of 12 EA-18Gs to Australia will likely be its last in the APA region unless the JFS program has some serious setbacks. On the bright side, Boeing will have opportunities for future MRO and upgrade contracts but further tactical aircraft sales throughout the region will be limited without a viable low-to-medium cost fighter/attack platform to offer the bulk of the more price sensitive Asian countries.

Lockheed Martin is counting on the JSF market expanding in the AP region but Singapore may be the only other potential customer within the next 10 years. Japan, Korea, and Australia are planning to acquire 154 F-35s in total. High price-tags and above average lifecycle costs along with program delays and performance concerns will likely hinder further sales with current and future customers in the region. This is especially true for countries faced with strained domestic budgets and tough choices between defense and social spending. Competition for limited acquisition dollars will be especially fierce in countries like South Korea (and their partner - Indonesia) as well as Japan who are all pursuing indigenous developmental 5th generation fighter programs. However, LM will continue to find profits in future MRO and upgrades contracts for the almost 400 F-16s in the region. The American aerospace and defense company will also share in the profits from additional KAI T-50 sales.

Security and economic needs will continue to drive demand for fighters in the AP region but competition will be tough. US OEMs can no longer assume that they will have a monopoly on the regions markets. US companies will have to be creative and flexible while offering their best fighter/attack aircraft products along with generous offsets in order to remain competitive in international markets. Future US fighters will need to be scalable in both price and technology in order to the meet the Asia-Pacific region's evolving economic and security demands.

Middle East and North Africa: Introduction

The Middle East and North Africa (MENA) region is home to nations with wealth due to vast oil resources. It is a region marked with constant turmoil and religious sectarian unrest that has continued for generations. Due to the threat of violent extremism, and the divide between Sunni, Shia and Kurdish sects, geographical boundaries are at times difficult to secure in order to maintain peace and stability. The US defense aircraft industry has flourished in the region providing most defense articles for all Gulf Cooperation Council (GCC) nations to include the North African countries of Egypt and Algeria.

As the US defense downturn continues, the fighter footprint in the Middle East and North African market will continue to be a major focal point for US firms as they compete with international defense rivals such as Saab, Dassault and British Aerospace EAP. For the foreseeable future, the US focus will continue to be one of enhancing the capabilities of the MENA nations, looking to operate with them as coalitions of the willing to combat threats as they emerge. A current example is the fight against ISIS where for the first time GCC countries such as Jordan, Saudi Arabia, UAE, Bahrain and Kuwait are participating and integrating with the US on the US Air Tasking Order (ATO). Without destabilizing the region the US has provided GCC nations with more advanced weapons and fighter aircraft, which has provided them much greater levels of interoperability.[19]

Market Opportunities and Challenges

The primary countries with market opportunities are the wealthy GCC nations who can afford US aircraft such as Saudi Arabia, UAE, Kuwait and Turkey. Due to the importance of the region on global commerce, and the Global War on Terror, the US has established itself in the region to stay. For this reason all GCC nations are continually training and doing exercises with the US, hence they will continue to buy US products. Also, stated was that many times the decision to buy certain platforms over others are politically motivated decisions. US firms need to continue to engage through the US State Department, continue to have local offices in each of the countries and continue to expand the MRO possibilities. The MENA region based on the threat of terrorism and important geographical position will always be considered a critical region where the US Department of Defense (DoD) will provide presence and look to strengthen ties with partner nations.

Indigenous industrial capabilities in the region are improving due to the interaction with US firms but still remain on the low end for skilled labor and an economic system that allows for growth. Turkey, Pakistan, Saudi Arabia and UAE have a slightly higher level of sophistication and ability than the rest of the MENA countries.

The following highlights some country specific opportunities for MRO and upgrades in MENA. This data was extracted from Jane's IHS 2014 database.

- Bahrain: F-16s are in need of mid-life upgrades (MLU) and service live extension programs (SLEPs). The country is dependent on US suppliers. They are also considering recapitalizing their fleets but cost is a concern for this small gulf country.
- Egypt: Significant numbers of F-16s will remain in use until at least 2020 and they are in need of upgrades but internal political turmoil and sanctions have strained defense budgets and international relationships. Competition upgrade contracts and recapitalization will be formidable between China, Russia, and recently France as well as the US (who recently decided to overlook human rights abuses by lifting sanctions on arms sales and reinstating ~$1.3B in annual military assistance.
- Iraq: Ordered 18 F-16s in 2011 and again 2012. The aircraft are being produced in Ft Worth, TX but deliveries are on hold due to concern for security of the equipment and weapons. There are also concerns for as safety of the US contractors and pilots who will need to help maintain and fly the jets in country for Iraq's fledgling Air Force.
- Jordon: Fleet of 60 F-16s and 20 F-5s that require MRO and upgrades. The Jordanian Air Force spent $416M on O&M in 2013 but still struggle to keep their fleet of fighters mission ready. Jordon is attempting to build a regional aviation service hub but will need help from to US to succeed.
- Saudi Arabia: Has one of the largest defense budgets in the world (~$48B in '14) and an extensive fleet of F-15s. Their C/D models are over 30 years old and are in desperate need of upgrades (if they remain in service). Delivery of their first of 84 new-build F-15SG is scheduled for 2016. This is part of a $29.4B contract that also includes upgrades for 70 of their 1995 F-15S models. Oil price fluctuation may impact future upgrade and recapitalization plans.
- Kuwait: 39 F/A-18C/Ds in service since 1992. Their fleet will continue to need US MRO support. The Kuwaiti Air Force is currently evaluating the Eurofighter, Rafale, and the F/A-18E/F for it's ~$700M - $1.4B supplemental fighter program.
- Morocco: Fleet of 23 F-16C/Ds since 2011 and 18 F-5Es. External funding and support is needed for MRO.
- Oman: 12 F-16C/Ds in service since 2006. They too rely on US MRO support to keep their fleet flying in support of regional counter terrorism/insurgency efforts. They jets also

act as a deterrent against possible Iranian aggression.

MENA is one of the most important regions in the world due to its strategic location and petroleum reserves. Three major chokepoints, the Strait of Hormuz, Straight of Bab el Mandeb and the Suez Canal have 80 percent of all worldwide shipping passing through them every day. It is also the region, which is a hotbed for terrorism to grow and flourish. Due to these planning factors the region has been part of the US's strategic focus since the 1950s.

As the GCC coalition has grown over the years, the importance of interoperability has increased. Iran's nuclear threat, the ISIS threat has galvanized the GCC relationship with the US. Due to these current events, and possibility for future unrest, GCC nations with their deep pockets will continue to be strong buyers for US firms. As the GCC coalition continues to build, with similar platforms the ability and potential for shared procurement, logistics and training is a strong possibility. The US is postured to remain the main supplier of fighter aircraft. A long-term US MRO plan needs to be developed between Lockheed and Boeing to provide the services and facilities to capitalize on this growing market. Additionally, the benefits of MRO go beyond just the money making potential for OEM's and for the US GDP. With the promise of lowering life cycle costs, GCC countries would be enticed to allow US firms to takeover MRO services. This will also increase the relationship with partner countries so that when the next procurement cycle happens, they will most likely buy US products and fighter platforms.

The appetite for future aircraft procurement in MENA to go to F-35 is a strong possibility. They can afford the high cost of the F-35; they also have a strong desire to fly the latest and greatest fighter aircraft that the US companies can produce, in fact UAE F-16's fly with more modern Block 60 aircraft then their US counterparts. Beyond the prestige of flying F-35, Iran continues to improve its Anti-Access/Area Denial (A2/AD) capability, and very soon the ability to operate in that environment will become a priority. Export limitations and ITAR requirements could possibly limit sales and this easing of restrictions should be the target of US firms. Turkey is the exception in the region; they are already a partner nation in the F-35 program. Potential conflict with Syria along their Southern border makes this a smart buy for the Turkish government.

For countries that can't afford the high end F-35 or even 4th generation fighters, in a few years as the F-35 starts to proliferate, the market will be flooded with F-16's. This will be an affordable way for poorer MENA countries, such as Yemen, to be able to purchase fighter aircraft.

Conclusion

The MENA region still has market potential for fighter aircraft for US firms. From new aircraft procurement to upgrading existing airframe fleets, US firms may find access to GCC countries to include a wide variety of services. Continued focus and improvements in MRO should be the focus in order to provide lower life cycle costs of fighter platforms, which should equate to big profits for US OEM's. Additional proliferation of F-16s may add to market MRO potential in the smaller countries.

Europe: Introduction

The Cold War and strong Euro-Atlantic partnership have allowed US fighters to dominate many West European inventories and provided significant profits for US defense companies. Since the 1990s, the situation has gradually changed. Europe now represents less opportunity for US OEMs due to the growth of the European defense industrial base (DIB) and shrinking defense budgets. In general terms, these significant structural changes within the European fighter market

need to be analyzed and findings properly implemented by the US aerospace and defense industry along with the US Government (USG) in order to preserve and promote fruitful cooperation with European partners and secure future sales.

Market Opportunities

The major mission areas that drive fighter procurement in Europe are determined by a respective national security strategy, the NATO Strategic Concept and EU Defense Strategy. In the early 2000s, there was a clear rivalry between the EU and NATO that "often took the form of tension between Europe and the USA."1 Problems were solved at the end of the first decade of the 2000s when both organizations redefined the division of labor between them. NATO left the previous concept when aspired to act as a global security provider and came back to its traditional posture to remain a primarily military actor that occasionally engaged in missions with a wider security scope. The situation with the EU military design is more dubious. "If the EU defines itself as a 'general security provider', its approach to armed conflicts and weapon production will differ significantly from that of a European defense industrial competitor to the USA. The choice between these two options would determine how European military forces would be used and the kind of equipment needed to accomplish their tasks."2

The European high-tech defense industry is purely national. Single defense programs are under strict national control and not based on principles of corporate efficiency. Even though the European defense market is gradually more open and competitive, it is still more challenging for US suppliers.

The top 8 countries with fighter market opportunities in Europe include Belgium, Denmark, Finland, Italy, Netherlands, Norway, Poland, and the United Kingdom. These countries all have established partnering relationship with the US and are open to Foreign Direct Investments (FDI). They also exercise a high level of governance as well as transparency. However, there are some slight differences between countries – e.g. Belgium has had a negative FDI index over last 5 years while Italy struggles with corruption.

It is important to note, that all 8 countries have different motivations for acquiring modern fighters including Lockheed Martin's new F-35. Countries' commitment to the US 5th generation multi-role fighter tend to validate the theory that bilateral alliances and the promise of domestic economic growth thru program participation tend prevail over realistic operational needs. The F-35 industrial model was sold to its European partners as a medium-cost, co-produced fighter. The aircraft has however become a very high-cost fighter that is causing structural changes to Europe's once independent tactical aircraft industrial base, while in effect, disarming the US allies through increasing costs and deepening European partner's dependencies on the United States for advanced military technology.

Current and projected funding profiles for the top 8 countries with fighter market opportunities are as follows:

- Belgium: Military expenditure 1.0% of GDP, $ 5.1B , annual GDP growth +0.3%, the aging fleet of F-16s requires replacement, its economy is hit by recession, no FDI in last 5 years, cannot afford the high-end platform, did not specified any requirement yet, no clear posture with respect to Netherlands procurement within common Air Defense
- Denmark: Military expenditure 1.4%, $ 4.5B, -0.5%, the aging fleet of F-16s, participate in the JSF program, no orders yet, its economy hit by recession, open to FDI, considering threats with regard to the High North concept, promising opportunity for US, blurred picture, possible procurement of F-18s;
- Finland: Military expenditure 1.2%, $ 3.7B, -1.2%, economy is not healthy, 100%

dependent on Russian gas/oil, the aging fleet of F-18s, ambivalent attitude to NATO/Russia, no clear signals/operational needs

- Italy: Military expenditure 1.5%, $ 34.0B, -1.9%, economy is in deep recession, key participant in the JSF program, licensed production of F-35s, going to replace Tornados/AMXs
- Netherlands: Military expenditure 1.2%, $ 9.4B, -0.7%, economy is hit by recession, participant in the JSF program, going to gradually replace F-16s by F-35s, heavily dependent on the US fighter production
- Norway: Military expenditure 1.4%, $ 7.0B, +0.6%, economy is growing, exports gas, going to replace aging F-16s, participates in the JSF, involved in the High North concept, regional security threats
- Poland: Military expenditure 1.8%, $ 9.4B, +1.7%, emerging CEE power, economy is growing, the Budgetary Act guarantees expenditures in 1.95% of GDP regardless the ruling party, successful procurement of F-16s C/D, going to replace the aging Soviet era fleet, very good opportunity for Gripen NG and/or T-X (Boeing-Saab), announced aspiration for F-35s in reaction to recent Russian military actions
- United Kingdom: Military expenditure 2.2%, $ 51.5B, +1.7%, slow growth, prospect from exclusive partnership w/ US, key partner in the JSF program, replacing Tornados by 60-80x F-35s, close military cooperation w/ France, adverse postures against the further EU integration. The UK is concerned about its diminishing role in the partnership with the US, therefore the JSF has got a priority in spite of the fact that the F-35 exceeds its operational needs

Conclusion

The USG and DoD try to support both domestic fighter primes with their foreign sales programs in an effort to support US DIB. The lack of competition in US domestic fighter production preserves the status quo but limits completion and stifles innovation. European Union (EU) fighter manufacturers are technologically advanced, but they suffer from a lack of unified coordination. The EUs combat aircraft industrial capacity is fragmented between various national champions which creates a European production capacity and limits market opportunities. The new EU directive (Defense Procurement Directive 2009/81/EC) presents challenges for emerging EU members who are trying to develop their domestic DIBs. This directive prohibits indirect offset programs, which may drive the creation of unified DIB that will eventually compete more effectively against America's powerful fighter duopoly.

European firms are focused on exploiting their existing 4.5 generation fighters without any apparent long-term research, development, and acquisition strategy towards their next indigenous combat platforms. It can also be assumed that the defense spending downturn trends in Europe will continue, regardless of Russia's hostile actions. The tightening budgets may force European air forces to adapt low-cost life cycle solutions in order to remain relevant. Finally, the future prospect for US fighter primes in Europe will be limited. Boeing's F-18E/F/G is competing for sales in Denmark and may have future market opportunities in Finland. However, US OEMs best hope for creating long-term value in Europe will be with the F-35 program as well as MRO/upgrade services for existing F-16/F-18 fleets.

Western Hemisphere: Introduction

Most countries in the Western Hemisphere do not face any significant external threats. Their security threats are largely from internal sources. In addition, their defense budgets are relatively small and more focused on defense capabilities that are better suited to combat internal threats. As a result, only a handful of countries operate fighter aircraft and the numbers are relatively small. This section will therefore focus on the countries that either currently have a fleet of fighter aircraft, or there is an opportunity for fighter sales. These countries are Canada, Mexico, Peru, Brazil, Colombia, Argentina, and Chile.

Fighter Aircraft Procurement Drivers

Due to the budget issues, some countries have dropped their jet aircraft procurement plans altogether. El Salvador wanted to buy 10 Super Tucanos from Brazil for $120 million, but their parliament considered the cost to be too expensive. Guatemala is another country that wanted to procure Super Tucanos, but contract negotiations were canceled based on costs. Nicaragua has similarly been unable to buy replacement combat aircraft due to the country's tenuous financial position.[20] [21]

Other countries have canceled or modified plans to procure fighter aircraft so that they can devote scarce resources to higher priority missions or other government infrastructure or service related needs. Although Mexico is the largest military spender in Central America, it scrapped its 2006 plans to procure six Sukhoi Su-27s to better focus on the internal security challenges it faces. Chile is forecasted to be one of the largest growing economies in the Americas at a five percent growth rate. However, its budget to procure an advanced jet trainer was slashed, likely allowing only for the acquisition of second-hand purchases. With few pressing security threats, the Chilean military is focusing more on reform and modernization.

Canada is a Level 3 partner in the F-35 program, but the high cost and performance concerns prompted the government to reconsider whether it wanted to stay with the F-35 or launch a new competition for a fighter replacement. A final decision is not expected until after the federal elections in 2015. Argentina has an aging fleet of French Mirage aircraft that are flying well beyond their retirement dates and a pressing the need for a replacement fighter. Several different options for a recapitalization have been considered, but economic strains have stalled efforts to field a new fighter.

Other countries are going forward with their efforts to buy new fighter aircraft, despite economic instability. Brazil easily has the largest defense budget in Latin America – $34 billion in 2014. However, even though its defense budget has tripled over the last decade, the global economic crisis has slowed the rate of defense spending and the defense budget has been subject to ad hoc cuts as part of wider government spending reductions. The countries' multi-role fighter aircraft program was designated the F-X2. The program was long-delayed, however Brazil announced in November 2014 that it had selected Sweden's Saab's JAS-39E/F Gripen to fulfill its future fighter aircraft requirement. The program anticipates the procurement of a total of 108 aircraft over three tranches, the first of the Gripen's to enter service in 2019. Not only will this procurement improve Brazil's security standing regionally and globally, it will provide significant opportunities to enhance Brazil's defense industrial capability and economic prospects through generous offsets.

Peru seeks to maintain a credible conventional deterrent on its southern border with Chile where a maritime territorial dispute lingers. This is driving Peru to complete its long-term plans to acquire up to 10 Super Tucanos for light attack and 24 Korean Aerospace Industries (KAI) KT-1s for training. While the deal for the KT-1 aircraft is progressing, with the first four aircraft

expected to be delivered in 2014. The Super Tucano agreement has not seen much progress since the agreement with Brazil was signed in 2012, probably due to economic constraints. Peru has also recently sought information from several manufacturers of combat aircraft, including Boeing, Dassault, Saab, and Sukhoi. They have already received an offer from Spain for 20 used/excess Eurofighter Typhoons.

Colombia appears to be moving forward with its plans to replace its fleet of Cessna A-37 Dragonfly training aircraft. Candidates for the replacement include KAI's T-50 Golden Eagle, the Alenia/Embraer AMX, the Aero Vodochody L-159 Advanced Light Combat Aircraft, and the BAE Systems Hawk. In addition, in light of military modernization efforts across Latin America (particularly Venezuela's purchase of Russian Su-30MKs), Colombia may seek to buy advanced fighter aircraft. Potential options for a multirole fighter for Colombia include excess US Air Force F-16s, Saab's Gripen, or a Russian platform.

Market Opportunities

Countries in Central and South America trend towards the low-end of the spectrum in fighter market opportunities. The countries with potential market opportunities in the Western Hemisphere include Brazil, Canada, Argentina, Chile, Colombia, Peru, and Mexico. These countries were identified as having market potential for several reasons, including their current fleet and/or future plans to procure fighter aircraft. Other factors for consideration include defense budgets/economic situation, corruption and transparency, FDI potential, offset potential, industrial capability, and the geopolitical environment.

Although the current fighter market in Latin America is not high, it could be an emerging market. Argentina, Brazil, Chile, and Peru are all seeking growth in the defense industrial sector. Procurements in these markets are projected to exceed global growth, though they are admittedly starting from a lower base point. Most increased military spending will go to other priorities beyond fighter aircraft, but it provides an opportunity for US firms to get into the defense industry on a smaller scale in those countries. If these US firms are able to give these countries what they want – technology transfer, lower costs, and increased economic prosperity – they may be able to significantly improve their industrial base. Helping to build the domestic industrial base(s) for WH countries will help foster future sales and supply chain market opportunities for US OEMs through regional economic growth and industrial/human capital development.[22]

The largest barrier to entry into the fighter market is the high cost of US fighter aircraft. The 2013 National Defense Authorization Act noted that the US Air Force planned to purchase 19 aircraft in the fiscal year 2014 at a total cost of $6.271 billion. The cost for those 19 aircraft is more than the total 2014 defense budgets in of Peru and Chile, and just under the entire defense budget of Argentina. Granted, at that price, the cost per unit is over $172 million; Lockheed Martin hopes to eventually get the price of the F-35 down to around $80 million apiece. It is unclear if that price will include the Pratt & Whitney F135 engine. Regardless, at that price, no countries in the Western Hemisphere – beyond the United States and Canada – will be able to afford F-35s.

Another barrier to entry can be a country's propensity to source defense articles internally or at least regionally. Brazil, in particular, has high preference for local sourcing of defense materials as reflected in its "Brazil first" measures, which includes its offset regime. These rules place foreign competitors at a serious disadvantage if they are competing against a comparable indigenous capability. Argentina is another country where foreign companies are at a disadvantage as a result of anti-privatization of the defense industry and the priority given to programs that have indigenous solutions over ones that require foreign involvement. US firms must consider their ability to bring unique and low-cost solutions if they want to overcome the internal priority

problem that may exist in some countries.

Finally, the biggest threats faced by the countries in Latin America are internal. Thus, the impetus for each of those countries to procure expensive fighter aircraft is relatively low. Brazil's desire to become a regional hegemon and a player on the world stage is driving their fighter aircraft procurement plans, but until another country in the region challenges that status, the military need for fighter aircraft will be less likely to materialize.

Indigenous Capabilities

Indigenous capability of the Latin American countries in the fighter aircraft market is relatively low, with the exception of Brazil. Brazil does not yet have the ability to build a modern fighter but they do successfully manufacture and export the Tucano and Super Tucano light attack aircraft. Embraer is one of Brazil's largest exporter and about 20 foreign air forces use Embraer products. The company has also been quite successful in manufacturing and exporting commercial airframes around the world.

The remaining countries in the region all have local companies or entities that provide MRO for their air force fleets. Some have also gotten into the business of manufacturing at least some aircraft components and parts. Argentina has gone even further and produced over 1,500 aircraft (not fighters) under license from other countries over the last century. Argentina is also in talks over joint production of the FC-1/JF-17 Thunder multi-role combat aircraft.

Along with Brazil, Canada is the other country with a fighter market that has fairly substantial indigenous capability. It does not boast an indigenous OEM of fighter aircraft, but does supply advanced components for large military platforms and systems to foreign OEMs. The following chart summarizes the indigenous capability of countries with fighter market potential in the Western Hemisphere.[23]

Conclusion

The market for fighter aircraft in the Western Hemisphere, with the exceptions of Canada and Brazil, is still in its infancy. There is emerging potential to increase the fighter industrial base, but several barriers exist, the greatest of which is lack of affordability of modern fighters. Other challenges include corruption and transparency, some hostility to foreign investment, transitioning or developing offset regimes, lack of advanced industrial capability, a need to spend defense resources on internal priority threats, preference for locally source defense solutions, and an uncertain geopolitical environment.[24]

Despite these barriers, US firms can view the region as a possible revenue source in the future, though care would have to be taken to cultivate the industrial relationships and navigate the precarious legal landscape. Defense budgets in a handful of more promising countries are projected to exceed average global growth rates. So, with domestic defense budgets uncertain, US firms may want to cautiously consider the Western Hemisphere as an area for future growth.[25]

Commonwealth of Independent States and Sub-Saharan Africa: Introduction

The objective of this section is to provide an analytical overview of the market for fighter jets in two regions, Commonwealth of Independent States (CIS) and Sub-Saharan Africa (SSA). Opportunities for US fighter OEMs in this region are very limited.

Market Sales and Upgrade Opportunities

Market opportunities for sales and upgrades are driven primarily by the security situation, economic prosperity, and national pride. This research included potential market opportunities for US fighters OEMs in the Sub-Sahara African countries of Angola, Kenya, Nigeria, and South Africa. The research also included the Commonwealth of Independent States nations of Georgia, Kazakhstan, Kyrgyzstan, Tajikistan, Ukraine, and Uzbekistan.

Commonwealth of Independent States (CIS)

The current fighter jet aircraft numbers in CIS include six for Georgia, 120 for Kazakhstan, four for Kyrgyzstan, four for Tajikistan, 194 for Ukraine, and 97 for Uzbekistan. All these ageing aircraft are from the former Soviet Union. Georgia, Kyrgyzstan and Tajikistan would like to recapitalize their tiny air forces but are focused on basic domestic security needs and constrained by struggling economies. Indigenous industrial capabilities are minimal.
Kazakhstan has a large, aging fighter fleet but budget constraints will only allow them to upgrade 10 of their existing Russian Sukhoi SU-27s. Ukraine spends 1.6% of GDP on defense and would like to replace its fleet of MiG27s and Su-27s over the next decade with an F-18 equivalent western fighter. This "may" be a opportunity for Boeing to get into the CIS market as well as improve ties with the USG – which is something Ukraine is actively seeking. Uzbekistan also has a relatively large fleet of fighters with plans to spend $100M to upgrade its fleet of Su-25s.[26]

Sub-Saharan Africa

The current fighter jet aircraft numbers in SSA include 79 for Angola, 18 for Kenya, 11 for Nigeria, and 26 for South Africa. Except for South Africa, which developed an indigenous jet aircraft capability during apartheid, all of these nations are entirely dependent on imports. The winners of the post-colonial civil war in Angola were dependent on Soviet armaments and there is every indication that Angola will continue to rely on Russia for its Sukhoi and MiG fighters.

Angola has committed to purchase 18 1990s-vintage Sukhoi Su-30 fighters retired from India in 2007. Military procurement in Angola is on the highest trajectory for the SSA region, but competing for sales with incumbent Russian OEMs would be challenging.

South Africa's fighter fleet is one third the size of Angola's, but the country's leadership wants to be recognized as a regional leader by playing a role in SSA peacekeeping missions. There is an effort underway to increase military capabilities after over 20 years of underfunding and neglect. However, problems persist as South Africa's Air Force is currently unable to maintain its Saab JAS-39 Gripen's due to a lack of experienced maintenance technicians and pilots. It is noteworthy that as recently as the 1980s, South Africa had robust defense industrial capabilities. However, these capabilities fell into disrepair as the nation struggled politically and economically following the end of apartheid. South Africa would like to return to higher levels of industrial capability. It does provide significant ~lower-end military exports, but its capabilities for high-end production will be limited in the near-term future. Of note, bribes paid in 2003 and 2005 by

a South African subsidiary of BAE continue to hang over the original Saab procurement decision.10

Among the smaller players, Kenya's concerns are driven by Islamic terrorism threats and the desire to serve in peacekeeping roles. It purchased old F-5s from Jordan in 2008 but most of the aircraft were unserviceable. In an effort to refurbish them through an African regional intermediary was unsuccessful. Defense purchases are expected to grow significantly and this may offer US OEMs an opportunity to serve as an intermediary for other refurbished low-cost fighters to help strengthen ties with this important developing country.

Nigeria is struggling with Boko Haram and other tribal conflicts. These internal security concern are expected to drive increases in defense expenditures. However, Nigeria "only spends 1% of GDP on defense yet has the largest military power in West Africa." The Nigerian Vision 20/2020 economic plan includes significant upgrades for their defense forces and their defense department has expressed interest in acquiring the Chinese/Pakistani produced JF-17.[27]

Conclusion

Fighter market opportunities for US OEMs in Sub-Saharan Africa (SSA) and the Commonwealth of Independent States (CIS) are assessed to be very limited at this time. This is due to the lack of a low-cost US export fighter along with existing industrial alliances in these regions with companies in China and Russia as well as small defense/acquisition budgets.

APPENDIX B: UNMANNED AERIAL VEHICLES BY REGION

UAVs come in a range of sophistication and price that collectively meet many military mission requirements. The range in prices allows many countries access to UAV capabilities, not just the ones with financial means to acquire exquisite high-end systems. UAVs provide a less expensive alternative to manned intelligence, surveillance and reconnaissance (ISR) platforms. UAVs also offer economic alternatives to operating expensive ISR aircraft, satellite based surveillance and communication networks, and precision strike capabilities. For a fraction of the costs of those national infrastructures, a localized UAV orbit could detect, fix, identify, and engage a surface target with precision munitions.

Worldwide UAV procurement is projected to increase over the next decade. Outside of North America, the Asia-Pacific region and Europe represent the largest UAV markets. While European defense budgets are on a long-term decline, UAV procurement remains a relatively bright spot. Many of the long term defense modernization plans prominently feature intelligence gathering and C4ISR capabilities in favor of large force structures. UAV systems can provide cost effective means of meeting many intelligence and C4ISR requirements and are therefore appealing to many militaries. UAVs also offer flexible configurations to meet a wide variety of military requirements.[28]

Unmanned Aerial Vehicles: MRO

UAV fleets are relatively young and small compared to other aircraft types. UAV fleets also have more numerous platform types and less concentration of similar subsystems than those other segments. The diversity of platform type and relatively lower platform values make assessing MRO opportunities difficult. With that said, maintenance and overhaul will inevitably be required. As UAV fleets increase in numbers and commonality, regional MRO concentration will likely begin to emerge.

UAVs are systems of systems including the airframe, ground control systems, sensor and communication systems and possibly weapon systems. There will likely be opportunities to modernize ground control systems for broader interoperability and integration into family of systems common operating environment. There will be opportunities to upgrade sensor systems for enhanced mission capabilities as technology and miniaturization enable more capabilities to fit within the same size, power, and weight constraints of the original airframe. Because of the modular nature of UAVs there will likely be opportunities to add additional mission systems like weapons and communications relay equipment. Frost and Sullivan estimates that the market for UAV systems and sensors will grow significantly over the next decade. In particular, MALE and HALE UAVs offer the opportunity for continued capability enhancement through upgrades. In 2013 more than 57% of the value of total military UAV systems was in their payloads and avionics.

Unmanned Aerial Vehicles: Offsets

As with the sale of fighters or rotary wing aircraft, many countries have explicit and legally binding offset laws or implicit expectations for industrial participation or joint ventures. The nature of these offsets depends on that countries defense industrial policies and aspirations: some countries want to absorb technical knowledge in order to establish their own aerospace and defense industrial capabilities while others might realize their comparative advantage lies in other manufacturing or agricultural sectors and would simply like to boost exports of those core competencies in exchange for their purchase of defense equipment. US International Trafficking in Arms Regulations (ITAR) also poses a barrier to US firms' entry into joint ventures or industrial

cooperation arrangements. In cooperative development ventures, ITAR restrictions on third party transfer of US technology can limit the ability of partners to fully use the products that were developed in a partnership with a US firm. Discussions with European defense company executives indicate that they see ITAR restrictions as a significant concern that limits future innovation and exports and therefore diminishes that value of a jointly developed product, thus deterring entry into a joint venture. ITAR and Missile Technology Control Regime (MTCR) rules also restrict what countries can procure higher end technology that are the more defining characteristics of larger, longer range UAVs.

Unmanned Aerial Systems: Indigenous Capabilities

Most geographic regions have indigenous aerospace capabilities. Europe and Asia Pacific in particular have significant aerospace capabilities, including the ability to produce smaller fixed wing and VTOL UAVs. With that said, none of these regions have indigenous firms that are currently capable of independently producing high end UAV systems competitive with those offered by Israeli and US companies. For that reason, procurement of HALE and MALE UAVs has been dominated by Israeli firms (Israel Aerospace Industry and Elbit) and US firms (General Atomics Aerospace Systems and Northrop Grumman). In several cases, Israeli UAV systems have been produced by under license with modifications to meet industrial participation and offset requirements of countries that Israel has sold other defense equipment. While European procurements have relied on imports for MALE and HALE UAV aircraft, indigenous firms can generally meet sensor and avionics requirements. It is important to note that development of indigenous full system capability is underway. In Europe, the multinational effort to develop the NeURON UCAV is intended to develop the technologies to one day produce an "ITAR free" M/HALE type of UCAV. The "Hammerhead" UAV, recently developed by Piaggio, has been ordered by the Italian Air Force as its launch customer. Although Piaggio is 98% owned by an Abu Dhabi based investment company, it has created an ITAR free MALE UAV that is intended to compete with General Atomics' Predator and Reaper. It is equipped with sensors and avionics primarily from another Italian firm Selex, which is a subsidiary of Finmeccanica.[29]

Unmanned Aerial Vehicles: Industrial Alliances

Drivers of industrial alliances include foreign access to specific domestic markets and the desire of those domestic firms to acquire the transfer of new technologies in order to preserve or develop specific indigenous capabilities. European defense industry is particularly interested in reducing reliance on Israeli and US firms, which requires advancing European UAV technology. Many countries in many regions view development of an indigenous UAV production capability as an easier first step on the path to developing an aerospace industrial capability. Initial partnering with a US or Israeli firm for co-development and co-production is a smart way to transfer technology to the local industrial base, that can be used in the future to develop and produce completely indigenous products. These schemes seem popular in areas with the perception of enduring security threats such as the Middle East and Asia Pacific. Abu Dhabi-based Adcom Systems builds the Yabhon UAV/UCAV for export.[30] An example of a joint venture feeding a research and development cycle would be the "Swedish Unmanned Group" partnering with the Vietnam Aerospace Association in November 2012 to build Magic Eye 1 UAVs in Vietnam, followed 6 months later by Vietnam's declaration that the Vietnam Space Technology Institute successfully built six UAVs and flew 37 test flights between May 17th and 19th 2013.[31] Other examples of past joint ventures include: Thales and Elbit cooperating to produce UAVs under

license, and EADS and Northrop Grumman cooperating to produce the NATO Alliance Ground Surveillance system. These ventures are examples that provide non-European firms access to European, Middle East, and Asian markets, proved work share arrangements and give European and Asian firms access to technology.[32]

Asia Pacific

Unmanned Aerial Vehicles Market Opportunities

UAV specific market opportunities are limited. HALE and MALE systems are not going to be sought in the numbers as the US Navy and Air Force. This is because of their price and the fact that those markets that can afford those expensive exquisite systems are likely already customers for the F-35 and have little procurement budget remaining. Complete systems in the $100 million range such as a couple orbits of Predator or Firescout have a much better chance of finding a funding wedge. Lower cost S/TUAV systems or partial orbit maritime domain awareness systems in the tens of millions of dollars range probably have a much more likely sales opportunity to the poorer countries like Philippines, Indonesia, Vietnam, and Malaysia that have large geographic swaths of oceanic space to worry about. These could be the federated maritime domain awareness

Japan

Market opportunities in Japan are limited for other than US defense companies. This is due to the longstanding security relationship dating to post World War II reconstruction, current market share and subsequent cost of substitutions should Japan choose to buy from another source. Substitution cost is the primary barrier to entry for European defense companies, and diplomatic and political alignment is a barrier to entry for Russian or Chinese companies. According to IHS Jane's, the major Japanese incumbents in the aerospace industry are Mitsubishi Heavy Industries (MHI, partnered with Lockheed Martin on F-2 program,) and Kawasaki Heavy Industries (KHI.) Other major defense companies are NEC Corporation, MELCO, Fuji Heavy Industries (FHI,) Komatsu, the IHI Corporation and Hitachi. Honda, Toshiba, Toyota, and Yamaha also have some defense capabilities.

Republic of Korea

Market opportunities in Korea are also limited for other than US defense companies. This is also due to longstanding security relationships resulting from the Korean War armistice. Korea presents the same barriers to entry as Japan, however, according to IHS Jane's, Korea has accepted some Russian defense articles and strategic materials as in kind repayment for debts that were loaned in the early 1990s as the Soviet Union disintegrated. Korea has extensive indigenous industrial and advanced highly technical capabilities, but does encounter a gap every now and then in the context of subsystem suppliers for larger programs. These industrial capability gaps are typically the result of Korea's commitment to procure from indigenous sources that may not be quite capable of delivering. These gaps do present opportunities for foreign suppliers if the offsets, FDI, and relationships schemes can be worked out. The major incumbents are Korea Aerospace Industries (KAI, partner with Lockheed Martin for the F-16 and T-50,) Korean Air Aerospace Division (partnered with Airbus on KF-X program,) Daewoo, SamsungThales (Joint Venture), Hyundai, and Kia.

Australia

Australia offers many market opportunities because they lack an indigenous industrial capability to produce complete systems. Their present capabilities are limited to aero structures, but their selection as an MRO provider for the F-35 program should help advance the development of a full spectrum capability for all aircraft. Although Australia has no offset policies, they do seek industrial participation for indigenous producers in the supply chains of the end products they buy. For example, Australia industry makes components for the F-35, P-8, F-15, and F/A-18 E/F/G programs. Australian industrial capability is limited to some aero structures, Acoustic Technologies, Electronic Warfare technologies, and cyber.

India

India has market potential. They have large budget forecasts and many programs in play, but they have an unreliable history in executing programs. Their main incumbent is Hindustan Aeronautics Limited, which is a state owned company and is in their partnerships with Sukoi to build SU-30s, to develop the PAKFA fifth generation fighter, and potentially Dassault for production of the Rafale fighter if that agreement is ever concluded. Of note, and as an indicator of the performance, effectiveness, and efficiency of HAL, local production of the SU-30 by HAL is reported to generally cost twice as much as it cost to construct one in Russia.[33]

Singapore

Singapore has very low barriers to entry for new competitors. Singapore has a commitment to competition (in addition to transparency and value for money) as a guiding principle in military procurements. Prospective entrants need to be involved and fully compliant in the Singapore offset and participation schemes to be competitive. The main company in Singapore is Singapore Technologies Engineering (ST Engineering). ST Engineering is the Singapore government's main vehicle to achieve self-sufficiency in all but original manufacture; they operate in four divisions which are marine technologies, land systems, aerospace, and electronics. ST Engineering can maintain, overhaul or customize upgrades for almost any defense article, but cannot act as an OEM.

Middle East and North Africa

Security, economic and political requirements are driving the unmanned aerial vehicle (UAV) market in the Middle East and North Africa (MENA) region. While overall country specific defense budgets may be smaller than other regions of the world, MENA presents opportunities for US firms through traditional export regimes as well as potential joint venture or host nation industrial participation constructs. This may shift US firm business models to accommodate an initial low yield acquisition from a MENA country, but may secure market presence and potential future business. UAVs therefore provide an entry to MENA defense markets that may compliment future US business in manned aircraft, land or maritime systems.

Afghanistan

Lacking any significant budgets for security or defense, Afghanistan largely relies on the US and the NATO Equipment Donation Program for military equipment. Through these entities,

Afghanistan receives mostly infantry, land combat vehicles, artillery and light air support. Equipment related to C4ISR or large airlift or fighter aircraft is relatively minor given the largely land-based security and police equipment requirements. Given these requirements, funding of military equipment will remain largely reliant on external parties such as the US or NATO. Afghan regulatory and political support will remain tied to US and NATO leadership for the near-term. In addition, MRO and offset opportunities is limited due to the funding and lack of indigenous political processes. As both US and NATO forces draw down, future funding for Afghanistan equipment and modernization remains undetermined. Afghanistan does not an indigenous defense industry and is therefore solely reliant on imports. The potential for US firms to create or enter a UAV market is low. The US and NATO have operated various tactical and medium altitude UAVs in the country in support of ground operations. However, it is unlikely that the Afghan government has the budgetary means to acquire and maintain these systems. If budgets and political support continue to support mostly land-based capabilities, then a potential market opportunity may exist with small, hand held UAVs in support of ground operations. These systems may provide low cost options with little operations or maintenance associated costs. The US may have a market advantage given its military and political presence in the country. However, the lack of internal political stability along with continued reliance on the US and NATO for security support, the market opportunity for acquiring unmanned systems remains low.

Iraq

The government of Iraq continues to deal with the security and political dynamics after years of war and instability. Concurrent with reconstruction efforts, Iraq, along with other Middle East nations are engaged in military activities against the Islamic State in Iraq and the Levant (ISIL) that threaten borders and political and economic systems. UAVs would be able to provide battlespace awareness against these threats. The US is currently the sole provider of UAVs to the government of Iraq. Iraq was due to receive Boeing subsidiary Insitu ScanEagle tactical UAVs as well as AeroVironment RQ-11 Ravens by the end of CY2014. Both these systems can provide limited support to ground based operations. While oil remains a key economic enabler, attempts have been made to increase Iraq's economic potential. However, the lack of political stability decreases transparency and tends to increase corruption. In this regard, military equipment procurement, as well as MRO and offset opportunities, face significant challenges. The potential for US firms to enter the UAV market is low. Two US firms have already entered the UAV market with small, tactical systems. While security requirements in Iraq may benefit from unmanned ISR support, funding for UAVs competes will all other military budgets. The government of Iraq will continue to need artillery and land based systems in order to meet their immediate threats. The probability for increased funding for UAV procurement remains low. Additionally, Iraq does not have an indigenous UAV industry and must therefore rely on imports. The ScanEagle and Raven procurements have signaled a preference for US or western unmanned systems. However, the current security environment and Iraq's political instability create significant challenges in further procurement of unmanned systems and associated MRO.

United Arab Emirates and Jordan

The United Arab Emirates and the Kingdom of Jordan operate the most advanced militaries in the Middle East and have maintained stable political and economic environments. The security situations endemic in the Middle East have required these countries to congruently develop and modernize land, air, sea and C4ISR military capabilities. UAE and Jordan have been allocating

funding toward research and development efforts in electronic warfare and ISR systems. Both countries are currently pursuing structures within the country to incorporate the advancement of UAVs. For example, UAE announced in January 2015 that it would be one of the first countries in the Middle East to regulate drone use.[34] Jordan currently operates two Camcopter S-100 rotorcraft small UAVs developed by Austrian company Schiebel. UAE currently operates the Austrian based Schiebel Camcopter rotorcraft UAV and South African based Denel's Seeker UAV. Furthermore, both countries have pursued efforts to increase its indigenous defense industries and to position them for potential export markets.[35]

The potential for US firms to enter the UAV market is moderate. The focus for UAVs in both countries is towards indigenous development. The governments have created structures and policies to encourage development and production as well as potential export. UAE and Jordan have demonstrated willingness to import military equipment. If both countries continue to signal interest in developing more advanced military capabilities, to include UAVs, then opportunities may exist for US firms with potential joint ventures, industrial partnerships or offsets. While the government of Jordan invests in mini and tactical UAV systems, a US firm may provide capabilities in the medium or high altitude UAV market segments. UAE and Jordan have already expressed interest in a medium altitude UAV capability. A US firm could then further expand the UAV market by creating and sustaining an MRO construct to support current and follow on UAV systems.[36]

Qatar

Qatar's political priority has been economic growth. While this has been the focus, military and defense spending has been marginally growing and priority has been placed on modernizing land, air and naval assets. Regional security concerns are the driver for this modernization effort; however, defense budgets are relatively smaller than countries such as UAE and Jordan. Qatar has a limited defense industrial base with a focus on maritime systems. Qatar operates ten imported Turkish UAVs, the Bayraktar hand held tactical system. Qatar has also partnered with French aerospace and defense company Thales to develop an optionally manned ISR airborne platform. The potential for US firms to enter the UAV market is moderate. Part of the military modernization efforts may require additional tactical UAVs or possible a medium altitude UAV. The teaming with Thales for an optionally manned ISR asset signals a potential trend towards more advanced technology systems and could provide an opportunity for a US firm to enter the market through either a joint venture or an industrial partnership model.

Pakistan

Pakistan's regional security concerns span the gambit of security dynamics from the threat of internal instability, to terrorism and instability along the Afghanistan border, to a near peer competitor in neighboring India. With a relatively stable government structure, Pakistan's economy has trended towards growth although the country will have to deal with high inflation and other needed economic reforms. Pakistan's relationship with the US is complex. There are shared interests and partnerships vis-à-vis the counterterrorism campaigns. However, due to corruption and other factors, the US participates in sanctions against Pakistan. US and western nations participate in technology transfer with Pakistan and US transfers are on a case-by-cast basis. Pakistan does maintain a defense industrial base but relies on imports for more advanced technologies. Pakistan operates indigenously produced ISR and armed UAVs, the Burraq and Shahpar systems. It also operates Italian firm Selex tactical UAV, the Falco.

The potential for US firms to enter the UAV market is low to moderate. Pakistan has demonstrated willingness to partner and preference for western advanced technologies. Pakistan's diversity of mission needs lends itself to a variety of unmanned systems for ISR and strike requirements. However, US firms may be limited by several factors to include US policy and US regional security concerns. While US policy may support certain types of arms transfers, dynamics in India, Afghanistan and Iran may enter the calculus. A US firm has potential in the UAV market through either small or tactical UAVs or a medium altitude platform. Joint ventures or offset opportunities may also provide an entry into the Pakistan market.

Turkey

Turkey's regional security environment is a major driver for military equipment procurement, especially due to its geographic nexus between Europe and the Middle East. Turkey's NATO commitment exposes the military to western equipment and interoperability standards. Specifically for UAVs, it has several indigenous firms developing systems and collaborating with Israeli firms for more advanced technologies. It is indigenously developing a medium altitude system and has expressed interest in potentially importing a MALE UAV.
The potential for US firms to enter the UAV market is moderate. With imports from Israeli firms for army and air force requirements, Turkey has signaled an interest in maintaining UAVs as part of their military inventory. With tactical UAVs in their military forces, there is potential for US firms to offer a medium altitude system. Additionally, there may be opportunity for a US firm to co-develop or partner with indigenous firms to produce UAVs.

Algeria

As one of Africa's largest defense markets, Algeria has invested in new weapons procurement as well as recapitalization of existing platforms. Its operational requirements are largely driven by domestic and border security issues such as counterterrorism and maritime security. Algeria has a limited defense industrial base and therefore relies mostly on imports for military systems. The country currently operates a South African sourced Denel Dynamics Seeker tactical UAV.
The potential for US firms to enter the UAV market is moderate. Algeria has expressed interest specifically for US systems for tactical, medium altitude and high altitude systems. However, budgets and political support are major limiting factors. Algeria has also expressed an interest in acquiring UAVs from other European and Middle Eastern producers for tactical systems, but has yet to procure additional vehicles. Russian producers had supplied its military inventory for land, air and maritime systems, however Algeria has signaled that it would like to shift to more western firms for import.

Egypt

Political and regional instability have influenced Egyptian military modernization and procurement. Even with the relatively new stability in governance, the defense budget has been steadily increasing. Regional and internal security issues are a major driver for advanced weapons systems procurement. Egypt has a limited defense industrial base and has recently signed an agreement with the People's Republic of China for domestic production of the Chinese ASN-209 multi-purpose tactical UAV for ISR missions. Egypt is also in the midst of acquiring a Turkish Anka tactical UAV. The potential for US firms to enter the UAV market is low to moderate. While

Egyptian requirements and procurements suggest recognition for the importance of tactical UAVs, the acquisition of the ASN-209 and the Anka UAVs may saturate the tactical UAV market. However, US firms may penetrate the medium altitude market for longer endurance, more technologically advanced payload systems for border or maritime security missions.

Conclusion

The overall potential for US firms to enter the UAV market in the MENA region remains low to moderate. Unmanned systems are slowly entering military inventories and requirements are increasing due the security environments. At the February 2015 International Defence Exhibition and Conference (IDEX) in Abu Dhabi, unmanned systems were highlighted as needed capabilities. Most exhibitions, displays and demonstrations focused on the smaller, tactical UAVs such as the Boeing/Insitu Integrator and the South African Denel Seeker II. However, challenges remain in funding and policy within countries in the region. US firms ought to be aware of the political, economic and security dynamics that influence procurement and industrial relations. The following factors are worth consideration for US firms seeking business in the MENA region.

Europe

The European UAV market can be segmented into two regions: Western Europe and Central/Eastern Europe. The two regions have individual market characteristics and security requirements. Western European countries have larger but declining budgets, and have wider ranging security concerns outside of Europe. In Western Europe the primary countries with opportunities are: UK, France, Germany, Italy and Spain, representing 90% of an estimated $9.9B UAV market from 2013-2022. The market is further segmented with MALE UAVs representing $5B, tactical UAVs representing $1.8B, HALE UAVs $0.8B and R&D representing $2.2B.

Central/Eastern European countries have relatively smaller defense budgets with some increase in defense spending, particularly in Poland. Due to the defense budget sizes, these countries typically rely on collective defense and participate in cooperative procurement. Russia represents over 75% of the estimated $8.5B Central/Eastern European market from 2013-2022. Poland accounts for the much of the remaining Central/Eastern European market. The market is further segmented with MALE UAVs representing $4.4B, tactical UAVs representing $0.9B, HALE UAVs $1.3B and R&D representing $1.7B.

Based on procurement budgets, access to MALE and HALE UAVs are limited to a small group of European countries. The NATO Alliance Ground Surveillance (AGS) procurement program is an example of smaller countries jointly funding a HALE UAV system (Northrup-Grumman RQ-4) with European sensor and ground station technology for shared ISR use.

Challenges and Barriers to Entry

The changing landscape of European offset requirements and expectation of industrial participation are a barrier to entry. Additionally, the tradition of favoring national solutions is still practiced except in cases where national defense firms cannot satisfy military requirements. In those cases importing defense systems is often used to acquire new technology which is considered as important as the systems themselves. Non-European firms seeking to win procurement contracts in Europe will therefore have to be open to work sharing and technology sharing arrangements.

US International Trafficking in Arms Regulations (ITAR) also poses a barrier to entry. In cooperative development ventures, ITAR restrictions on US technology limit the flexibility of European partners to fully use the products developed in partnership. Discussions with European defense companies indicate that they see ITAR restrictions as a significant concern that limits future innovation and exports and therefore diminishes that value of the product. ITAR and Missile Technology Control Regime (MTCR) rules also restrict what countries can procure higher end technology including weapons and larger, longer range UAVs.

Industrial Capabilities

European companies have significant aerospace capabilities, including the ability to produce smaller fixed wing and VTOL UAVs. With that said, European firms cannot independently produce high end UAV systems competing with those offered by Israeli and US companies. For that reason, European procurement of HALE and MALE UAVs have been dominated by Israeli firms (Israel Aerospace Industry and Elbit) and US firms (General Atomics Aerospace Systems and Northrup-Grumman). In several cases, Israeli UAV systems have been produced by European firms under license with modifications to meet industrial participation requirements. While European procurements have relied on imports for MALE and HALE UAV aircraft, indigenous firms can generally meet sensor and avionics requirements.

Industrial Alliances

Drivers of industrial alliances include foreign access to specific domestic markets and the desire to acquire new technologies or preserve specific indigenous capabilities. European defense industry is particularly interested in reducing reliance on Israeli and US firms which requires advancing European UAV technology. Past joint ventures include: Thales and Elbit cooperating to produce UAVs under license and EADS and Northrup-Grumman cooperating to produce the NATO AGS. These ventures are examples that provide non-European firms access to European markets, proved work share arrangements and give European firms access to technology.

Another driver of industrial alliances include Future Combat Air System (FCAS) initiatives to develop indigenous European Unmanned Combat Aerial Vehicle (UCAV) capabilities. Companies including Dassault, BAE, Thales, Rolls Royce, Safran, and SAAB are cooperating on the NEURON project using both public and private funding. Discussions with European industry indicate that the NEURON project has advanced UAV and aircraft design technology. Another FCAS project is the BAE Systems Taranis project, a technology demonstrator designed to explore UCAV feasibility. The French and British Ministers of Defense signed letters of intent launching a joint UCAV studies beginning in 2014 including Dassault, BAE Systems and other NEURON participants.[37]

Finally, there is a desire on the part of European industry for a European MALE UAV, particularly in France, Germany and Italy. Companies including Dassault, Alenia and EADS are vocal in their support for a cooperative development and procurement of a MALE UAV capability. Three firms have entered into a work sharing arrangement on a project called MALE 2020. “The issues at stake include European operational sovereignty and independence in the management of information and intelligence as well as European industrial independence in sustaining key competencies and jobs within Europe,” said a source from the Italian company Alenia Aermacchi. “This is not possible with a non-European made UAV. The program would furthermore be orientated to foster the development of ITAR-free high technologies and contribute to sustaining

key competencies and jobs within Europe."[38]

United Kingdom

The UK is the largest defense budget in Western Europe. The budget is stable but trending slightly down over the next several years, from $61.6B in 2012 to a projected $56.8B in 2018. A major security review was completed in 2010, known as the Strategic Defense and Security Review (SDSR). In 2013 the UK published a rolling "Ten Year Equipment Plan" for procurement over the next decade including emphasis on ISTAR capabilities. A previously unfunded "black hole" or gap between planned spending and funding for procurement has been reconciled.

The UK operates a variety of UAVs including Elbit Hermes 450s produced by Thales under contract as well as General Atomics MQ-9 Reapers. Thales is also developing the Watchkeeper UAV based on the Hermes but with more British content. The UK has requirements for a number of UAV systems including a follow on MALE system to augment the Hermes/Watchkeeper and Reaper, VTOL UAVs for maritime operations and tactical UAVs for the Royal Marines and Army. The UK has also indicated interest in leasing VTOL UAVs for maritime ISR operations.

France

France is the second largest European defense budget. The defense budget is stable over the next five years at $42B per year. France is lagging other Western European countries out of the global economic crisis and is experiencing pressure for economic reform. Defense spending is under the NATO expectation of 2% of GDP. Military modernization and procurement are driven by the 2013 Defense White Paper and the Projet de Loi de Programmation Militaire (LPM). The White Paper outlines new MALE and tactical UAV requirements.

Like the UK, France operates MALE UAVs produced under an industrial collaboration between EADS and Israel Aerospace Industry. The concept of "Frenchisation" is used for joint ventures which is focused on importing advanced technology and designs and then specializing systems to meet French military needs. Frenchisation allows a high degree of local participation, targeted technology transfer and facilitates locally sourced MRO. Future UAV procurement will favor French "National Champions" and seek to close capability gaps between French and US/Israeli firms.

Germany

German defense spending is trending downward from $43.9B is 2011 to a projected $40.9B in 2018. The last Defense White Paper was published in 2006. As a result, Germany is undergoing long-term force reduction cuts to meet 21st century threats. Six key capability areas are protected, including C2, ISR and mobility.

Germany operates a number of UAV types including the IAI Herron MALE UAV. The IAI Herron is leased through a joint venture between IAI and Germany's Rheinmetall Defense. The German Defense Minister has publically stated that she favors leasing new UAV systems. The German government recently requested the purchase of three General Atomics MQ-9 aircraft and four ground control stations to augment their MALE UAV fleet. Finally, the German government operates the Euro Hawk HALE UAV, a Northrup-Grumman RQ-4 with German sensors and ground stations procured through a joint venture between Northrup-Grumman and EADS. This program has been troubled by cost and airworthiness issues, but demonstrates a model for high end UAV procurement.

Italy and Spain

Italy and Spain represent Europe's fourth and fifth largest defense budgets respectively and are in the top fifteen in the world. Both have been hit particularly hard by the global financial crisis and face significant defense spending declines with further declines projected over the next several years. Italy's defense spending is trending downward from $28.5B in 2012 to an estimated $28.1B in 2018. From 2012 through 2014 Spain's defense spending has been reduced from $13.9B to $13.6B. As a result, Spain has reduced or delayed procurement quantities of major programs such as the Eurofighter and A400.

Italy operates a variety of US made tactical and MALE UAV systems and is also participating in the NATO AGS program. With domestic security concerns from illegal immigration and commitments to NATO missions, Italy is likely to have future UAV requirements. Spain has a future requirement for VTOL UAVs to be deployed on Spanish naval vessels supporting maritime security and counter-piracy.

Poland

Poland is one of the largest Eastern European defense budgets, up significantly over the last several years. They are transitioning from a conscript to a professional military and have significant procurement programs in place. Poland is seeking to recapitalize Russian defense systems with western systems to promote NATO interoperability. They recently selected General Atomics MQ-9 Reapers to meet MALE UAV requirements. Poland also has a UAV system roadmap with future requirements for a variety of tactical and MALE UAVs including outstanding tenders for tactical UAVs.

Conclusion

While European defense budgets are on a long-term decline, UAV procurement remains a relatively bright spot. Many of the long term defense modernization plans prominently feature intelligence gathering and C4ISR capabilities in favor of large force structures. UAV systems can provide cost effective means of meeting many intelligence and C4ISR requirements and are therefore appealing to many militaries. UAVs also offer flexible configurations to meet a wide variety of military requirements.

MRO opportunities are limited due to the wide variety of UAV systems in use, the lack of geographic or type concentration and small size of many UAVs in use. Over time there will likely be more type concentration of larger UAVs such as the General Atomics MQ-9 Reaper which is now operated by a number of European militaries. As that concentration occurs regional MRO opportunities will likely begin to develop. Additionally, UAVs are modular systems offering significant upgrade opportunities, particularly in the avionics, sensors and ground control station segments.

The future roles of HALE UAVs and UCAVs are not entirely clear. There are a number of European technology demonstration and UCAV feasibility studies underway. It is not yet clear what combination of autonomy, weapons and sensor carriage and low observable design will fit future European UCAV requirements. HALE UAV systems have demonstrated utility providing persistent surveillance but given their high cost the right mix of HALE and UCAV capabilities must be determined before further investment is made in developing new systems.

Western Hemisphere

The US and Canada are included in the Western Hemisphere however will not be a focus of this region. The US has the biggest market for UAV systems representing over 60 percent of the global market. Although the demand for ready-trained UAV operators and UAV systems is high in the US, the UAV growth rate is expected to remain stable over the next several years. Challenges due to economic downturns, rising O&M and personnel costs, and resourcing priorities for Asia-Pacific rebalance are a driver of this stable growth rate. Canada, while in a similar situation as the US with a withdrawal from combat operations, is focusing on defense recapitulation. While there is a potential $1.5 billion UAV acquisition planned to fill a homeland security capability gap and arctic surveillance, this has been delayed pending further ISR requirement. Market opportunities exist among various Latin American countries. These countries are Brazil, Chile, Colombia and to a lesser, riskier extent Argentina and Mexico. Regional security dynamics, economic outlook, MRO, offsets, industrial alliances and market opportunities will be discussed within the Latin America region.

Brazil

Brazil has the biggest South American UAV market and largest market potential. Political and military drivers focus on power projection in dense jungle areas such as the Amazon and Andes. An extensive aerial surveillance capability is the top Air Force priority. The procurement process is very politicized with a large emphasis on modernization and indigenous solutions as a main priority. Although domestic solutions are preferred, the Elbit Hermes UAV system is currently utilized. Brazil has indigenous UAV capability but it is limited in the mini category. Seventy five percent of Brazil’s defense budget is spent on personnel therefore, a large portion of claimed funding will limit procurement options in the future. Brazil's defense spending and funding profiles should stabilize over the next five years and should remain between $33 to 35 billion but will slowly decrease in percent of GDP spent on defense. Inflation, personnel costs, and fluctuations in the value of Brazil's currency are the main forecasted challenges regarding defense spending and UAV procurement.

Within the last two years, Brazil announced through its "FINEP" initiative that investment planning will include $1.5 billion for innovation and development in the aerospace and defense sector. Foreign direct investment is limited and largely restricted especially for nuclear energies and border activities. Some workaround opportunities exist in joint ventures or subsidiary investments. Transparency is generally "good" when procurements are handled through services however, as mentioned above, procurements can become very politicized making movement and progress difficult.

Actual MRO opportunities for UAVs are to be determined. With small and tactical UAVs, the modular design, and relative "remove and replace" concept of this category of UAV, MRO opportunities are virtually non-existent. Brazil's MRO and upgrade budgets remain in other conventional equipment and aerospace platforms. Potential opportunities, although not defined, may exist with engines should Brazil acquire a more robust MALE fleet. Again, this is highly speculative and only a potential opportunity.

A Latin America regional theme for offsets include an increasing interest for offset strategies but no specific focus on UAVs. A couple of varying views on offsets include direct strategies such as seeking advanced technologies within the respective country or a more indirect offset strategy such as oil for arms counter trade type strategy. Official offset policies are relatively new, have emerged since the early 2000s, and are more focused on manned aircraft rather than

unmanned systems. Brazil specifically has an evolving offset policy which is meant to increase coordination and flexibility.

Colombia

Colombia is Latin Americas second biggest market and number 32 on Central Intelligence Agency website of top 50 GDPs. Security is focused on leftist insurgents (ex FARC), para-military groups, drug trafficking and potential for uprising from the population due to the large inequality of wealth. The current Defense Minister took a hard stance on security which has opened the door for trade and foreign business. Oil and mining industries are healthy and growing due to the resource rich nature of Colombia. These security challenges mentioned above caused the military to focus on counter-insurgency capabilities and border patrol rather than conventional forces.

Economically, Colombia has received significant US aid in the past however this assistance has diminished. Defense spending is healthy in relative terms and is expected to remain fairly stable for the next several years at just under 3 percent of GDP. As mentioned, there is a strong emphasis on ISR, counter-insurgency, and border patrol effort.

Colombia's industrial base is limited and efforts have been made to grow this indigenous capability. Unfortunately this effort is challenged by foreign direct investment bans on defense industries. UAV indigenous capability does exist in the tactical UAV category but there is room to grow. Currently, Colombia operates the Boeing “Scan-Eagle” for ISR missions.

Offsets are viewed as secondary to the primary acquisition but emphasize industrial, commercial or economic improvement. Ironically, FDI is prohibited in national defense and security items. This policy may need to be reviewed for further development of industrial and commercial capability to spark economic growth and further industrial partnerships and alliances. Currently, Colombia is engaged in relations with Israel, Brazil, South Korea and Spain to bolster industrial and indigenous capability.

Chile

As a regional economic leader, Chile's political and military conditions receive a very good ranking regarding corruption and crime internal to the government. This transparency and positive model of government certainly assists Chile's evolving market and robust economy. Political and military drivers include the need to modernize, some social unrest, and territorial disputes. UAV procurement funding competes with land requirements; such as the self-propelled howitzer and amphibious assault vehicle, other aerospace requirements; such as electronic warning systems and manned aircraft, and sea capabilities; such as amphibious warfare ships and modernization requirements.

Economically, Chile is stable and defense spending is predicted to increase over the next several years. As the third largest defense spender in Latin America, the FY15 defense budget is marked at $9 billion dollars and expected to increase to over $10 billion by FY19. GDP is also expected to see growth over the next five years however defense spending as a percentage of GDP is expected to decrease slightly. The US is Chile's number one import source with $16 billion in transactions in 2013. A solid history of defense trade with the US exists which enabled Chile to receive a privileged status of a trade partner. There is an open policy on foreign investment and is relatively free from formal barriers to FDI. Transparency has some room for improvement since finances of state owned companies remain opaque.

Chile's offset policy was established mainly for the acquisition of F-16s in 2002. Although the offset policy is relatively new, both direct and indirect offsets are allowed. While Chile enjoys

indigenous capability in the small/tactical category of UAVs, Hermes 900s have been purchased. Focus of offsets will be on co-production opportunities, tech transfers, and development of new export markets.

Argentina

Market opportunity in Argentina may involve a higher degree of risk. However, Argentina's recent strong economic growth coupled with the fifth largest defense budget in South America and large commitment to maintain military spending makes this country a potential opportunity. Argentine military priorities focus on conventional forces procurement programs and some modernization specifically with mine-counter measures, armored wheeled vehicles, and potential for a multi-role fighter. Interestingly, Argentine defense forces have indicated a development restart for a tactical and HALE category UAV estimated for completion in 2017.

Economically and politically, Argentina is fragile. Despite the 2001 default, Argentina enjoyed strong economic growth since. Although defense spending is about 1 percent of GDP, the government is firm on continued defense spending. Potential market entrants must consider government corruption and the possibility for procurement programs to be stalled and lacking transparency. Challenges center around projected defense spending as it is likely to remain flat with administration and policy making somewhat erratic. The "Buy Argentine Labor" law may hinder some foreign market potential since a heavy focus is placed on indigenous solutions first.

With no official offset policy, Argentina is willing to peruse offset and counter trade strategies. With a limited technological infrastructure and government fragility, regional ventures or joint projects may avoid potential risk.

Mexico

Mexico, like Argentina, may have some opportunity but with increased risk. The Mexican government and military focus is improvement of internal security. Organized crime, gangs, drug trafficking and cartels inside of Mexico and crossing the borders are a key driver of persistent ISR capability need. Although procurement plans are small and UAVs (ex: Hermes and Skylark) are operated within Mexico, there exists a long history of trade, arms sales and security relationship between US and Mexico. Furthermore, Mexico is planning capabilities around low-intensity conflict rather than on large investments in conventional forces. This is a notable difference between Mexico and several South American countries.

The Mexican government is seeking ways to further tie security relationships and the aerospace industry is emerging within. Defense spending as a percent of GDP has historically been low however, the current administration is committed to internal security and ISR capability.

Foreign direct investment virtually has no restriction and no formal offset policy exists but has been used in the past. Future offset agreements will likely focus on education, health services or industrial capability. These key conditions may pose an opportunity for market entrance since market access is fairly well established.

Commonwealth of Independent States

The market size and opportunity for the various countries within the Commonwealth of Independent States is relatively smaller than western hemisphere comparisons however some opportunities exist for unmanned systems. Within this mineral-rich and resource dependent region, the four countries identified with possible opportunity consist of Azerbaijan, Kazakhstan, and

Ukraine, and Uzbekistan. Overall, this region places focus on upgrades and modernization of older conventional equipment typically received from Russian sources or US partner capacity sources. That said, a few countries have identified aerospace systems as a priority and place emphasis on counter-insurgency, air defense systems, or ISR capability.

Total defense budgets are relatively small when compared to other global regions and the industrial capability and existing indigenous high tech capability lacks. Several countries show positive signs of growing procurement budgets, rapid defense growth, and the emphasis on ISR capability requirement. Kazakhstan will have the highest projected GDP growth over the next several years peaking in 2018. Azerbaijan and Uzbekistan also show an upward trend regarding GDP growth rate however, a much smaller rate and total amount peaking in 2018.

Regional challenges include significant political and economic instability, widespread corruption, and limited transparency. Each of these challenges vary from country to country. Furthermore, indigenous capability and infrastructure lack.

Offsets are an increasing interest across the region but no specific policy or codified guidance exist for UAVs. Some countries view offsets as garnering local participation to develop industrial capability and capacity. Overall, offset policies are relatively new and emerging. MRO and upgrade opportunities for UAVs are very limited. Furthermore, MRO/upgrade budgets remain in other conventional categories of aerospace, land and maritime sectors.

Kazakhstan

Kazakhstan is placing emphasis on expanding its defense trade and tighten security relations with partner nations. Prioritization of capability requirements placed air assets, to include UAVs, at the top of the list. Kazakhstan's 2011 "Military Doctrine" and "2030 Economic Transformation Strategy" are the governing or guiding documents for this prioritization. UAV indigenous capability does exist in Kazakhstan through the assistance of joint ventures.

Total defense budget over the next several years is expected to rise from approximately $2.48 billion in 2015 to $3.5 billion in 2018. As a percent of GDP, defense spending is expected to remain relatively flat. Kazakhstan is projected to have a growing procurement budget and has shown interest in joint venture relationships on UAVs. Publically, the country has stated its interest in the exportable version of the Predator and interest in the Russian Irkut UAV. Currently, Israeli made UAVs are operated within Kazakhstan. The range of specific UAV system forecasted to be required vary from tactical through MALE/HALE category. Potential market entrants should be aware that joint ventures and other partnerships through the Kazakhstan Ministry of Defense (MoD) is the most effective route.

Transparency of procurement practices have had a poor track record and Kazakhstan is ranked very poor. Offset options exist and should be expected in order for Kazakhstan to grow its industrial base however, no codified guidance exists and any agreement is managed by the MoD. Furthermore, Kazakhstan is attempting to shy away from NATO equipment due to overall high cost. Price sensitivity and interoperability should be considered by potential market entrants.

Multi-lateral relationships are expected to grow, specifically between US and China, and multiple joint ventures exist with several European nations to include Italy, France, Israel, and Turkey.

Azerbaijan

Azerbaijan is also rich in natural resources and has an oil backed economy. Defense requirements are driven by regional conflicts with Armenia and maritime disputes with Iran. Land

and aerospace systems have been given a high priority by the government. Specifically, air defense systems, helicopters, UAVs, and upgrade programs. Currently, Azerbaijan operates medium, range UAVs and have a large interest in patrol and ISR capability of oil and gas fields.

Economically, Azerbaijan will have the largest defense budget of the three CIS countries peaking in 2018. Growth rates are expected to flatten since the largest growth in defense spending was from 2005 to 2011. UAVs have and will be a central focus of defense spending. Israeli companies have a firm grasp on the Azerbaijan market so potential market entrants must determine a competitive strategy.

Some indigenous UAV capability exists within Azerbaijan through joint ventures but mainly in the tactical or lower category of UAVs. For MALE or higher category, Azerbaijan is still reliant on imports and expertise from foreign countries. Azerbaijan is engaged with Israeli companies, such as Elbit and IAI, for Hermes, Heron, and Orbiter UAV.

Potential market entrants should be aware that joint ventures are also key to gaining market access. Specifically in areas where Azerbaijan lacks in industrial capability and industrial base needs development. Also, transparency and human rights violations should be considered since this ranks very low on a global comparison. Offsets should be expected but are not required. Any possibility of offering offsets to entice contract engagements will be looked upon favorably since offsets are an emerging concept.

Uzbekistan

Uzbekistan has the lowest potential for market entrants of these three countries analyzed. Recovering from US sanctions in the mid-2000s, the current regime is focusing on maintaining balance and increasing ties with western countries. Furthermore, bilateral defense relationships are developing between the US, UK, and Germany. Diversifying defense suppliers is another focus of Uzbekistan although MRO of existing capabilities will be the priority. The government and military is focusing on increased training and counter-insurgency missions

Economic data and defense spending and UAV indigenous capability is difficult to assess. Economic growth is apparent over the last few years and projected to increase. MILPER and O&M costs may be a challenge for Uzbekistan since this is approximately 90% of an estimated defense budget causing key procurement activities to be squeezed out with the high demand of spending required by these areas. Albeit small increases on a global scale, Uzbekistan may focus more on smaller, less expensive equipment to add to its military capability in the future. Market opportunities may exist in the small and tactical UAV sectors/categories.

Multiple challenges exist for gaining access to Uzbekistan. For example the government is still reliant on Russia as its principal supplier of arms. Donations for increased partner capacity still exist today although decreasing to some extent. Its maintenance and upkeep practices are poor however, these practices may offer an opportunity for entering market share.

Sub-Saharan Africa

Tactical UAVs are operated by a small number of the Sub-Saharan African countries. Market potential is limited. Regional political and military drivers of aerospace procurements are aging equipment requiring upgrades or modernization, severe equipment shortages or poor maintenance practices, assistance with peace operations, border security, internal security, crisis response, and counter-terrorism operations. Although industrial base varies from country to country, overall the technical industrial base is very limited but exists for low end capability within some countries. Small arms, vehicle or small equipment maintenance and MRO makes up the

majority of the existing defense industrial base.

Overall, declining budgets of various countries are a challenge. Funding uncertainty is caused by multiple factors such as government corruption, oil dependency, lack of foreign investor attraction, poverty, unemployment, crime, insurgency, limited education, and lack of high tech industrial base.

Sub-Saharan countries were reviewed and assessed based off the same criteria as the Western Hemisphere and Latin American countries. The UAV market potential, albeit limited, that does exist is primarily within the tactical and possibly MALE categories. The countries with the greatest market potential are South Africa, Kenya, Nigeria, and Angola. As mentioned earlier, the market size is expected to more than double within the next five to seven years. While these are the top four countries within Sub-Saharan Africa with UAV market potential, each vary in degree of defense spending, corruption, procurement drivers, security issues, and industrial base. Furthermore, entrance to this market may not occur under the traditional construct of direct industry to government. Options such as joint ventures, and regional partnerships, and utilizing the US government as a market entrant may be better suited for some of these countries. This will be discussed further in the "So what" paragraphs that describe the regional implications to US Original Equipment Manufacturers.

South Africa

South Africa is the most developed country of the sub-Saharan African region and is in the lead regarding economics, military and governance acceptability. The government is stable and political and military relations serve the country well. Corruption has been apparent in the past and transparency efforts have exposed past issues and serve to prevent future occurrences.

South Africa for some time neglected its defense industrial base and is striving to improve and correct previous shortfalls by avoiding boom and bust programs and ensuring that FDI consists of over half country ownership. The political and military structures have listed four defense goals and multiple milestones that are driving procurement, actions, and funding profiles across all services. Additionally, the South African national defense forces (SANDF) in their 2014 review identified unmanned systems as a "Major Focus Area" and key technology for the future. This shows the level of importance and seriousness South Africa is placing on unmanned systems.

Economically, South Africa is behind Angola in overall defense budgets. Defense budgets are expected to slowly increase over the next several years from $4.4 billion (USD) to $4.7 billion by 2018. Percentage of GDP is expected to fall very slightly. One concern is country requirements exceeding budget and fiscal realities. Should the defense budgets not rise fast enough to meet expected timelines, the military goals and milestones will be delayed.

South Africa has indigenous UAV capability with multiple industries involved in UAV development. Some of these industries are state owned and supported by private small to medium enterprise companies. While South Africa is open to joint and cooperative ventures, the government strives for multi-year procurements to avoid the boom and bust programs to maintain procurement stability.

South Africa welcomes foreign direct investment but investors and foreign companies should ensure understanding of South Africa's ownership restrictions of indigenous capabilities and South African companies. MRO exists in the private sector and includes more advanced technologies such as avionics, engines, and aeronautical structures. MRO is limited with UAVs however, a joint venture undertaken with Safran focuses on gas turbine engines so some applicability may be present. Due to the more complex designs of South African developed or operated UAVs, sensors and avionics suites, MRO future opportunities may exist.

Offset agreements will focus on an industrial participation leveraging economic benefits and promotion of South African industry through defense acquisition. This is driven by the need for economic growth, and access to new markets and trading partners. Direct offsets are targeted.

Through the African Growth and Opportunity Act (AGOA) and the Trade Investment and Development Cooperation Agreement (TIDCA), South Africa and the US have an avenue for cooperation, trade and industrial alliances.

Angola

Angola has extremely little defense industrial infrastructure but has the largest military of the Sub-Sahara African countries. Political stability is moderate to low. Procurement practices have been disjointed and reflect more political functionality rather than military functionality. Drivers of Angola's requirements are border security and internal security. There is an emphasis to match S. Africa's military might and also to ensure neighboring country violence and criminal organizations do not infiltrate Angola.

Economically, Angola has the largest procurement market of sub-Saharan Africa and is projected to spend 4.7 percent of GDP on future defense. In fact, military spending increased over 60 percent from 2011 to 2014. A major contributing factor to Angola's economic boom is their hydrocarbons reserves and export benefits. The protection of this strategic export is a main driver of military and security requirements. While the economic outlook figures seem positive, Angola is not without its challenges.

As mentioned above, the industrial base is virtually non-existent. The 27-year post-civil war reconstruction effort of the social infrastructure and economy is ongoing. Corruption and transparency is a problem.

Angola is involved in defense relationships with Russia, China, Brazil, and specifically Israel regarding UAV and unmanned capability. No formal offset policy exists but Angola has a National Development Plan to promote job growth, economic stability, and overall expansion of the industrial base. Foreign Direct Investment is encouraged however, the corruption and internal instability causes potential investors to shy away from market opportunities.

Nigeria and Kenya

Nigeria and Kenya suffer from very similar issues as Angola. This section is reserved for only main differences between these countries and Angola as well as key reasons why these two countries could be a potential market investment.

Internal terrorism, ISR capability, and quest for internal improvements for both countries are drivers for UAV and unmanned capability. Nigeria has the largest military in West Africa and has stated its "20/2020" vision of economic improvement and defense upgrades. Kenya is focused on border security and maritime patrol. A 2014 government memorandum stated expected growth in expenditures for defense and defense related capabilities.

Economically, overall defense budgets of both countries are lower than Angola. Nigeria is expected to spend 8 percent of its defense budget on procurement from FY15-19 and Kenya is expected to spend almost 13 percent of its defense budget on procurement. This is compared to Angola's 10.8 percent.

Israeli UAVs are present in both countries. MALE and tactical categories are utilized in country however, full extent of operations are limited. Nigeria has an indigenous UAV in development however, operational specifics are not known. Kenya does not have indigenous UAV capability.

While both countries have limited industrial relations, neither have formal offset policies. Nigeria has relied on military aid for various capability areas mainly from the US and other countries such as UK, France, Russia, and China.

These dynamic political, military, and economic conditions in Nigeria and Kenya are challenging for market entrants. However, industry should be aware that the demand for these systems is increasing from these countries. Several US government programs exist to gain some market access and serve as a competitor for current UAV industry (Israel) with an existing foothold in these countries.

APPENDIX C: ROTORCRAFT BY REGION

International helicopter markets are characterized by countries looking to modernize aging fleets and are a relatively untapped opportunity for US rotorcraft OEMs. However, these opportunities are limited and US OEMs cannot expect the large number of airframes they are accustomed to with developed nations, but are still solid market opportunities that may result in regional opportunities where greater numbers and MRO service contracts can be secured. As mentioned above, US designed and built aircraft already have a good global footing and represent the highest helicopter standard available, albeit at a price of high standard helicopter as well. Countries also often look to US produced aircraft to ensure interoperability with US and US allies as well as the potential security cooperation benefits of US contracts. Also, helicopters are positioned well to solve some of the range, operational and security issues nations are facing in these regions.

Asia Pacific

Asia Pacific has the most potential for US helicopter manufacturers. Driving these market opportunities are the regional security dynamics and threats to the freedom of the global commons and territorial sovereignty. These markets are further enabled by rising economies of many of the emerging Asia Pacific nations. Helicopter procurements satisfy many of the Asia Pacific Nations' need for maritime capabilities as well as land-based support of humanitarian aide/disaster relief (HA/DR) requirements and missions to solve combat civil unrest when necessary.

Along with the rising economies of emerging countries comes the need to develop the industrial base of these countries through offsets and potentially through joint ventures. Countries such as Japan and Korea already produce helicopters in the region and Japan has entered into joint ventures with Boeing and Sikorsky to build US designed helicopters domestically instead of through traditional procurements. US OEMs can expect the offset and joint venture trend to continue in the Asia Pacific and must successfully navigate this market dynamic to be successful. The greatest opportunities for US helicopter OEMs exist where joint ventures and US bilateral agreements are well established and are in Japan and Korea. There is also potential to replicate this successful model in India as they look to modernize a large aircraft inventory over the next 20 years. Frost & Sullivan, an aerospace and defense think-tank, predicts the Asia-Pacific helicopter market will reach $14.8 billion by 2022 and although the global military rotorcraft segment is expected to decline, an estimated total of 1,265 military helicopters will be purchased by 2022 in the Asia Pacific region with Japan, Republic of Korea, Taiwan, and Australia being the foremost buyers.[39] Japan and South Korea are looking to update an aging fleet of UH-60 Blackhawks, CH-47 Chinooks, and AH-1J Cobra fleets. Taiwan has 62 AH-1W Super Cobra and 54 UH-1H Iroquois, which also require replacement. Some aircraft are upgrade candidates; however, there is still a substantial requirement for new- builds as countries expand their fleets.

Japan

Japan has the largest defense budget in the Asia Pacific region with $55.1 billion spent annually. They have 690 total helicopters in the inventory worth over 10.3 billion and all but 42 are of US OEM design. US OEM domination in Japan is not likely to change but competition is present and US OEMs cannot expect exclusive access to Japan's defense helicopter market. Japan's long history and bilateral agreements have allowed positive relationship and joint partnerships with US firms. Kawasaki Heavy Industries produces CH-47 Chinooks and Mitsubishi Heavy Industries produces UH-60 Blackhawks domestically under license from Boeing and Sikorsky respectively. Japan also plans to replace its ageing AH-64 Apache fleet by buying 62 AH-64 Block IIs (which was limited to 13 units due to budget constraints). Japan needs to also purchase 150 utility helicopters to replace aging UH-60s and is looking to diversify by competing joint venture candidates between Augusta Westland's AW169, Airbus Helicopter EC145 and the Bell 412 ending the US domination of joint ventures in Japan if Bell is not selected for this contract. The most interesting, albeit small, rotorcraft acquisition by Japan is the purchase of 17 V-22 Ospreys from the Bell Boeing venture for an amphibious assault force able to defend the island chain and remote islands. With the Marine V-22s in the region and the Japanese demonstrating this same capability may increase the demand for this design and potentially allow a country to skip a generation of technology in conventional rotorcraft if they can afford it.

Republic of Korea

Another long time bilateral partner in the region, Korea has the second largest helicopter fleet with 532 total helicopters worth 4.4 billion with only 54 of non-US design and manufacture. Korea has historically been a solid market for Boeing, Bell and Sikorsky for decades with numerous sales supporting the Korean military and a domestic joint venture with Sikorsky to domestically produce UH-60s under license. This joint venture speaks to Korea's desire to build their defense industrial base much like Japan and has led to the development of domestic helicopter building capability by KAI. Over the next 10 years Korea plans to replace their fleets domestically with the over 200 domestically produced Surion helicopters (developed through joint venture with Eurocopter, now Airbus Helicopters) to replace UH-1s and UH-60s. They are also developing a Light Attack Helicopter (LAH) in coordination with Airbus Helicopters to replace AH-1s and have a domestic attack helicopter capability. Despite being a longtime ally of the US, The Republic of Korea is a regional example of a nation striving to achieve self- sufficiency to produce their rotorcraft needs which will reduce market opportunities for US helicopter OEMs in Korea and potentially the entire region if Korea builds a successful export market.

India

India has nearly 1000 helicopters in their inventory. Most of these are of Russian design and build but India also has a domestic capability in HAL that produces the Dhruv. Like both Japan and Korea, India is striving to fill their military needs domestically however, the Dhruv's capabilities fall well short of India's needs considering their security environment. Indeed, India still imports over 70% of its defense products. While governance, corruption and transparency provide challenges to doing business in India, US helicopter OEMs may successfully follow the regional models used in Japan and Korea for a potential joint venture with HAL to fill the massive helicopter need in India. Boeing has recently secured contracts for the purchase of 22 AH-64

Apaches and 15 CH-47 Chinooks signaling openness to US helicopter OEMs.

Middle East and North Africa

It is consistent that the MENA countries with the most helicopter market potential for US OEMs are historically the top spenders on defense. Countries that want US and allied interoperability favor US designs and the best available technology however, there is also a health mix of European and Russian built helicopters in the region as well. While the MENA region currently ranks fourth in total helicopter market revenues, its economic health, continued threats, geopolitical importance and large number of US produced rotorcraft platforms in their inventories make the region a viable rotorcraft market for future procurements, MRO and upgrades as well as current and future joint ventures and industrial alliances.[40] Defense spending, threat needs and US produced equipment are the main factors driving US OEM opportunities and are the basis for the analysis among the top five countries discussed in the MENA region. Based on the diversity in governance in the region and regional distrust, it is not likely that regional industrial or MRO opportunities exist between two or more governments and MRO facilities will likely have to service individual countries with a regional management system to gain efficiencies. The greatest market opportunities for US rotorcraft OEMs in the MENA region are
United Arab Emirates, Turkey, Saudi Arabia, Israel and Egypt.

United Arab Emirates

The United Arab Emirates (UAE) is a significant spender on defense with an annual budget of 14.4 billion and have a significant number of US manufactured helicopters in their inventory that creates a healthy market for US rotorcraft firms.[41] They have 162 helicopters in their inventory with 108 of them of US manufacture. This inventory and the balance in favor of US aircraft is also reflected in the UAE's procurement plans for additional CH-47s, UH-60s and 30 additional AH-64D Block IIIs in addition to the upgrade of existing Block IIs to Block III configuration. The UAE also shows potential for rotary wing innovations with their announcement of a contract to Abu Dhabi Technologies to upgrade and arm 23 of their UH-60s for close air support configuration.[42] The UAE also announced interest and are in the process of purchasing Bell – Boeing V-22 Ospreys for their special forces.[43] The introduction of this aircraft in the region and its potential future proliferation may expand the use, applications, reliability and possibly lower the cost of this new platform potentially increasing global demand and shape future demand signals for the rotary wing industry.

The UAE has no rotorcraft production facilities, but are building capabilities through MRO and upgrade facilities. Two companies are active in this market are the afore mentioned Abu Dhabi Aircraft Technologies (ADAT) providing airframe, engine and components MRO and Advanced Military Maintenance, Repair and Overhaul Centre (AMMROC) which is a joint venture between Sikorsky, Lockheed Martin and the state owned Mubadala providing military aircraft MRO. Foreign direct investments in the UAE are at 10.5 billion, although no more than 49% may be invested in UAE defense firms.[44] Foreign investments are encouraged and joint ventures are preferred. The UAE's industrial base is currently considered to be in a fledgling state and only began in earnest in the 1990s, causing continued reliance on foreign procurements to equip their defense requirements and is projected to remain their industrial base's condition in the future. The UAE's offset program is set at 60% of defense procurements and aimed at local employment, training and development of their newly formed defense industry workforce as well

as diversification away from a hydrocarbon based economy.[45] The UAE's transparency rating is both regionally and globally high with high regulatory quality and virtually no corruption for foreign firms to navigate. Transparency in the procurement process, however, is less than transparent and can cause issues for firms looking to enter UAE's defense procurement markets.[46]

Turkey

Turkey also represents high rotorcraft industry market potential with 18.2 billion in defense spending and FDI of 12.9 billion. Turkey's defense industry is driven by a challenging security situation geographically surrounded by unstable nations and faced with internal civil discord among ethnic groups. While these factors are significant for defense, Turkey's goal of an independent defense industrial base is a dominant factor governing defense procurements, FDI regimes and offset policies. Turkey's helicopter inventory currently has 321 helicopters of which 298 are of US design.[47] However, the preponderance of US OEM aircraft in Turkey is not of particular significance based on the age of the 249 Bell helicopters, mostly procured before 1990 and in need of replacement by more modernized and capable aircraft. Turkey's procurement strategy and industrial development program is aimed at being able to accomplish the modernization of their helicopter fleet indigenously beginning with production of the Sikorsky S-70 known in Turkey as the T70 and the licensed production of an upgraded Agusta Westland designed A129 known as the T129 in Turkey. The current production of the upgraded T129s is underway and under development. Production of the T70 is set at 109 airframes for Turkey with future plans for export. While joint ventures represent less overall profit for US OEMs, and sometimes described as skinny deals, they are an entry into a market that would otherwise be taken by a foreign firm. With the success of the Turkish programs, US OEMs can expect joint ventures to be preferred by nations with the industrial and technological capabilities to produce rotorcraft in the future. These domestic production capabilities develop their industrial base, enhance their economy and reduce dependence on foreign nations allowing independent military capabilities. Turkish MRO and upgrade facilities are also extensive for both civil and military aircraft providing additional opportunities for foreign investments and US suppliers. Turkey sees itself as a center for aircraft support given its strategic location and neighbors with limited aircraft capabilities.[48]

Turkey's FDI regimes, offset policies and procurement strategies are governed by their desire to build an independent defense industrial base. Their industrial policies encompass a very long term and strategic plan to turn defense procurements into defense production and export which has been largely successful, resulting in one of the largest defense industrial base in the MENA region. There are no legal limitations to foreign ownership of Turkish companies, however joint ventures are a highly encouraged and offset requirements are formulated to shape joint ventures as the most efficient way to invest in Turkish industry while satisfying offsets. The top rotorcraft industry example in the region is the joint venture between Turkish Aerospace Industries and Alp Aviation Industries partnered with Sikorsky Aircraft Cooperation. This joint venture is considered the model offset program for Turkey, which satisfies offsets for Sikorsky, Lockheed Martin, Boeing and Airbus. Turkey receives an average rating on transparency, but high rankings for openness to foreign investors with the government working to facilitate foreign investments resulting increased tech transfers and increase domestic industrial production.[4950]

Saudi Arabia

Among the five nations representing the greatest helicopter market potential in the MENA region, Saudi Arabia far and away tops the list with defense spending with 56.7 billion. Saudi Arabia has 125 helicopters within their Air Force, Army and Navy. Of these, 92 are of US design with 30 of those 92 airframes of US designs being produced under license by Augusta Westland. Saudi Arabia has a preference for US designs which is reflected in future Army procurement plans for 24 AH-64E Apache helicopters, 12 UH-60M Blackhawk helicopters and 24 AH-6 helicopters to augment the aging AH and UH fleets in existence. These additional 60 airframes bring Saudi Arabia to 185 total helicopters with 152 of them of US designs representing not only significant market sales for US OEMs, but also significant opportunities for future upgrades and MRO of existing and future US aircraft.[51] Saudi Arabia has no independent helicopter production inside the country, but does operate significant MRO facilities supporting helicopter maintenance and upgrades. The Alsalam Aircraft Company was created in 1989 through offset agreements and provides growing MRO and upgrade support for the Bell 412, 212, 206 and 406; the Boeing AH-64 and the Sikorsky UH-60 as well as many other military and civilian fixed wing platforms. Foreign Direct Investments top 9.3 billion annually and are highly encouraged and considered a top priority in Saudi Arabia as they seek to diversify their oil dominated economy. Saudi Arabia has no stated limit on FDI but the goal is set at 50% or less in defense industries. Saudi Arabia's offset demands are encapsulated by their program of "Saudisation" which is a program to transition from procurements of defense equipment to the formation of a Saudi Arabian defense industrial base with the ability to produce and sustain domestic defense equipment employing Saudi nationals. Minimum quota is set at 35% minimum with both direct and indirect offsets allowed. Saudi Arabia's offset program has fallen well short of its goals of "Saudisation" due in part to their inability to absorb and build technical and industrial capabilities and also due to bureaucracy and lack of transparency.[52] The country receives low rankings for transparency in defense spending, causing difficulties for foreign investors and limiting the effectiveness of their offset programs. However, Saudi Arabia continues to represent significant market value and potential for US OEMs in procurement as well as MRO and upgrades in addition to the potential to develop future joint venture opportunities assembling US designs and potentially producing helicopter sub components.[53]

Israel

Israel is a longtime strategic partner of the US and, as the world's only Jewish state surrounded by enemies, has significant defense needs. Israel spends over 17 billion annually on defense and receives 3 billion in US military aid that must be spent on US military products, creating high potential market opportunities for US firms. Israel's rotorcraft inventory contains 136 helicopters and all but 13 are of US design and manufacture. US OEMs are not likely to face any serious competition from foreign competitors in Israel considering US and Israeli relations and US military aid.[54] The US supported Israel with over 3 billion last year, accounting for over nearly a quarter of their defense budget. Israel also differs politically from many of the European nations on the Palestinian issue pushing them even closer to the US for defense systems procurement; however, budget constraints and financial commitments to the F-35 have limited their investments in rotary wing platforms. Israel plans to upgrade and refurbish aging CH-53s and AH-64s in their inventory over procurement of new systems, however, they are considering newly built CH-53Ks and AH-64Es in the future. Most interesting is Israel's purchase of six Bell - Boeing V-22 Ospreys. Originally thought to be a replacement for the CH-53 the V-22 gives

Israel the possibility to strike deep strategic threats with Special Forces. It remains to be seen if Israel uses the V-22 strictly in a Special Operations application or in a more conventional role or both, but it is significant that tilt rotor systems are proliferating to other countries globally. As the US, and now other countries, expand their use of tilt rotor platforms and demonstrate the expanded capabilities and the reliability of tilt rotor aircraft; they will gain greater attention and could shape the rotorcraft market for the future. Israel's defense industrial base does not produce helicopters as they continue to rely on foreign procurements mostly from the US, however, Israel does produce multiple aircraft subsystems such as avionics, communication systems, aircraft countermeasures, navigation equipment and helmet mounted systems just to name a few. Israel also has significant MRO capabilities for rotary wing platforms through the state owned Israel Aerospace Industries (IAI) and their many subsidiaries. Even though Israel's does not directly produce rotary wing aircraft, their aerospace industry is highly developed and in many cases is a direct competitor with US firms for subcomponents and MRO services. Israel encourages foreign direct investments and has external capital inflows of 11.8 billion annually with no limitations except government approval of foreign investments in defense industries.[55] Israel manages very strict offset policies, but does not term them offsets. Israel's program is termed industry cooperation program, where foreign companies enter a legally binding agreement designed to maximize benefits to Israel through technology transfer, employment of Israeli nationals and for the promotion of Israeli exports. Procurement quotas are set at 50% of the value of the contract and must be realized through an industrial cooperation agreement. Both direct and indirect offsets are allowed through industrial cooperation and multipliers are also awarded on a case-by-case basis. Israel's industrial cooperation programs have proven very successful and have built a high tech industrial base, which is competitive against several international defense firms. In direct contrast to Israel's clear offset policies, they receive a very low grade for transparency despite their close ties to the US and their extensive and high tech defense needs. Israel has cited security concerns as the cause, but analysis states that weak policy and no published legislation as the root causes for lack of transparency making business for US firms difficult. Despite the difficulties, Israel remains a viable market for US helicopter OEMs well into the future.[56]

Egypt

While Egypt ranks 50th in global defense budgets with an annual expenditure of 4.4 billion, their procurement history, rotorcraft inventory, military industrial capabilities and close ties to the US (including US military aid), make them a profitable market for US defense firms. The US annually provides Egypt with 1.3 billion USD in Foreign Military Financing (FMF) with the agreement the funding is spent on US military equipment. It is estimated that US aid covers 80% of Egypt's Defense Ministry's weapons procurement costs. Egypt has 195 operational helicopters of which 61 are of US design and manufacture. While the balance of these numbers does not favor US designs, the preponderance of the non US designs were purchased before US and Egyptian relations were established in the late 1970s and before the start of US military aid to Egypt.[57] The age of this equipment coupled with the stipulations of US aid to Egypt highly favors US OEMs for procurements. Currently Egypt is seeking to secure 10 additional AH-64 Apaches and is currently overcoming US foreign policy hurdles placed after the military takeover in Egypt. As the government stabilizes and US and Egyptian resume, ample market opportunities exist for

US OEMs to replace 30 plus year old helicopters under the stipulations of US military aid.[58] Egypt does not have domestic rotorcraft production, but are looking to develop a domestic defense industrial based. They have struggled due to dependency on procurement over production or joint ventures, but have established firms able to provide maintenance, repair and overhaul for Russian and French designs in their inventory. Indeed, Egypt's military industries are the largest in the Arab world and are completely state control through the state owned company Arab Organization for Industrialization (AOI) and its numerous subsidiaries. Egypt is focused on developing their already robust military industrial capabilities, but is challenged by unstable governance and reliance on procurement of US produced equipment funded by US aid. Successful joint ventures exist in Egypt, most notably with Egyptian production of the Abrams main battle tank, which represents the potential for future joint ventures in aerospace that have been so far limited to MRO and a small production of K-8 trainers / light attack aircraft. Egypt does not have a published offset program, but is looking to emulate successful offset strategies such as those in Jordan to further develop their domestic defense capabilities.[59] While Egypt represents strong current and future potential for rotorcraft industries, firms face unstable governance and low transparency. Moreover, the USG and US firms must work to maintain Egypt and US relations. The newly elected Egyptian government may be indicating they are distancing themselves from the US, signaled by their intent to purchase 24 Dassault Rafale jet fighters from France.[60] The movement away from US firms for defense procurements and a strained US and Egyptian relationship would have both economic and strategic implications.

While the MENA region currently ranks fourth in total rotorcraft revenues and projected to fall to fifth, the region still represents significant rotorcraft market value and high potential for the future, especially considering flattening market opportunities in North America and Western Europe. Continued violence, continued strong economies, the need to modernize ageing helicopter fleets and the quality of, and the preference for, US designed rotorcraft and support presents continued and sustainable market opportunities for US OEMs. The worldwide dominance of Sikorsky's UH-60 / S-70 is clear as is the global preference for Boeing AH-64 for counties who can afford and support it. Boeing's CH-47s represent one of the only viable, affordable, all weather capable heavy lift aircraft and is being sought by several nations globally. However, the most interesting of all procurement trends is of the MENA region nations is the procurement of the Bell – Boeing V-22 Osprey. These sales and the expanded use of this new platform that spans the gap between helicopters and fixed wing aircraft have the potential to shape the future of the rotorcraft market. As the US Marine Corps, US Air Force Special Operations Command, the US Navy and now Israel and the United Arab Emirates expand the use of the V-22, establish its reliability and potentially lower unit and maintenance costs, it has strong potential to change the demand signals in a large portion of the rotorcraft market.

Europe

Europe is both a challenging and interesting market from a US helicopter OEM perspective. It is incredibly challenging for US OEMs based on heavy competition from Airbus Helicopters and Agusta Westland already well established and arguably preferred and protected by Western European nations looking to support the regional economy. The market is also challenging and interesting in the respect that there is no real European market considering the diversity in governance, economies and security dynamics across the continent. Affluent and powerful countries are looking for high-end equipment and facing limited threats while others seek to replace aging, Soviet era aircraft with significant regional threats and internal civil unrest.

Despite organizations such as the European Union (EU) with its Common Security and Defense Policy (CSDP) and Collective Defense among the North Atlantic Treaty Organization (NATO) nations, there is not a strong and powerful political lead in Europe that would establish a common policy and common acquisitions among partner nations. It has been tried with the NH90 helicopter produced by NHI being a primary example but has had limited success to achieve commonality in defense procurements. In essence, the European helicopter market is very diverse and impacted by many political, economic and security dynamic factors leaving opportunities for US helicopter OEMs able to successfully navigate these factors. While the preponderance of the European markets are essentially closed to Airbus Helicopter and Agusta Westland dominance, markets do still exist for US helicopter OEMs. In order of significance they are the United Kingdom, Poland and Italy.

The United Kingdom

The United Kingdom is the US's closest European ally and spends over 60 billion annually on defense. They have the third largest helicopter inventory in Europe with 477 total airframes, with an even US and European design mix. This mix is due in large part to Westland Aircraft which became Agusta Westland in 2001 after a merger between Finmeccanica's Agusta and Westland Aircraft. This merger supports strong domestic helicopter production capabilities in the UK requiring their support. Current helicopter acquisition programs aiming at replacing 70 current Lynx fleet helicopters for surface combatant maritime rotorcraft and battlefield reconnaissance helicopter showing strong support of Agusta Westland from the UK's Government. However, Boeing enjoys a significant portion of the UK helicopter market albeit also through Agusta Westland. The UK is currently acquiring 14 Boeing Chinook HC.6 for its Royal Air Force in addition to the 52 already in their inventory. The British Army has also acquired 66 AH-64 Apaches since 2000 also built under license by Agusta Westland. This joint venture is a clear demonstration how a US helicopter OEM can successfully compete even in a country where a favored domestic helicopter production incumbent already exists.

Poland

Poland spends 9.3 billion annually and is likely to sustain this budget thanks to constitutional law requiring defense spending as 1.95% of GDP. Poland has 214 helicopters in their inventory largely comprised of Russian designed and produced helicopters in need of replacement. Poland is one of the most interesting countries in Europe from a helicopter market opportunity perspective as they look to meet their defense helicopter needs domestically. As there is no real helicopter manufacturing capacity, Poland is open to international competition. Competitions will take place between international manufacturer and according to Poland's policy; involvement of national industries will be favored as a way to acquire competencies. Consequently, two major acquisitions were launched. The first one worth USD 3.8 billion is to procure 'Kruk" attack helicopters to replace ageing Mi-24 helicopters. This important competition should see bidders such as Agusta Westland/Turkish Aerospace Industries T129, the Boeing AH-64E Apache 'Guardian' and the Airbus Helicopters EC 665 Tiger and Bell Helicopter with its AH-

1Z. This acquisition is expected to be signed earlier than formerly expected because of raising tensions with Russia.[61]

The second opportunity is the medium lift acquisition worth USD 3 billion for a total of 70 helicopters. The main competitors expected are Sikorsky with its subsidiary PZL Mielec with S-70i Blackhawk, Agusta Westland with its subsidiary PZL Swidnik, and Airbus Helicopter teaming with Polish Heli Invest. Bidders here come through their Polish subsidiary to bolster their offer, or through a partnership with a Polish company (for Airbus Helicopter). Airbus may look a little behind the two other companies because it does not have the same local base as Sikorsky and Agusta Westland, and that count weight in the final countdown. These two acquisition programs show significant market opportunities in Poland for helicopter manufactures able to provide quality products through joint ventures satisfying Poland's desire to expand their defense industrial base.[62]

Italy

Italy spent over 30 billion on defense in 2014. They have 171 helicopters in their inventory, which are not a mix of European designed Agusta Westland aircraft, and US designed aircraft built domestically by the Finmeccanica subsidiary of Agusta Westland that is Italy's national champion. Indeed, Finmeccanica is state owned and Italy's principal defense aerospace group. In addition to the production of Boeing designed AH-64s Apaches and CH-47 Chinooks, Agusta Westland is also committed to production of Europe's NH90 helicopter through their participation in the NHI consortium along with Airbus Helicopters and Fokker of the Netherlands. Logically, Italy is procuring 60 NH90 to replace their current utility helicopter fleets. More importantly, and one of the best opportunities for a US helicopter OEM in Europe, Agusta Westland has secured a contract to domestically produce the Boeing CH-47 Chinook. Augusta Westland signed this agreement in 2007 and to date has secured 26 Chinooks for Italian defense and have produced CH-47s for the United Kingdom and the Netherlands. Surprisingly, Agusta Westland also secured an agreement to produce AH-64 Apaches even though they produce a direct competitor in the AW129 Mangusta. Italy has 57 Mangustas in their inventory but have produced AH-64 Apaches for the United Kingdom and the Netherlands as well. Agusta Westland's business model shows incredible flexibility not only producing their own designs but also US designs in high demand thereby increasing their market share while still supporting their domestic defense industrial base and economy. This complex business model also shows how a US helicopter OEM can enter and profit in a market through joint ventures, licensed agreements and industrial partnering even where direct domestic competition exists.

Western Hemisphere

An assessment of the political and military aircraft procurement drivers paint two contrasting pictures. On one end of the spectrum, there are relatively stable countries like Brazil, Canada and Chile which are chiefly concerned about maintaining the integrity of their borders while seeking to assist U.N. peacekeeping missions. On the other end, there are many politically unstable countries that are consumed with internal security risks due to corruption, drugs cartels

and extremist groups. Either way, the need for rotorcraft is clear. The question then becomes who can afford them?

The economic environment in the western hemisphere can best be described as "mixed." Examining the market in absolute terms of Gross Domestic Product (GDP) and defense spending significantly narrows the number of countries that could even consider modern aircraft procurement, much less rotorcraft. For example, the GDPs of most Caribbean countries are below $10 billion US Dollars (USD).15 Moreover, most do not even have military forces, only local law enforcement. From a list of 39 countries in the region, only nine report over $1 billion USD in annual defense spending. This fact creates potential competition between priorities. In other words, even though countries "want" rotorcraft, there are significant questions about whether they can afford them. For example, in Brazil, almost 73 percent of the defense budget is directed towards personnel costs.24 The result is an inherent tension of competing priorities. The other countries surveyed have similar spending profiles. Moreover, defense spending for the next several years is flat. Only Brazil, Canada and Chile are projecting modest spending increases. As a result, rotorcraft procurement is required to compete with the rest of a country's power projection desires. Unfortunately, rotorcraft procurement is not high on anyone's list.

Within the context of military rotorcraft, indigenous maintenance, repair & overhaul (MRO) capability is used to increase autonomy as well as improve a country's industrial capability, labor force, and economy. Of course, maintaining an MRO capability only makes sense if you have enough rotorcraft to justify the required infrastructure. Unfortunately, many of the countries in the Western Hemisphere only have modest amounts of rotorcraft, many in the single digits. In addition to MRO, the opportunity to provide system upgrades becomes a potential market option. Because the rotorcraft inventories of the countries in the Western Hemisphere are generally upwards of 40 years old, upgrade opportunities may offer a thrifty alternative to new procurement.

Of the 39 countries in the Western Hemisphere, only seven surface as potential market opportunities: Argentina, Brazil, Canada, Chile, Colombia, Mexico, and Peru. Understanding the indigenous industrial capabilities of these countries provides an understanding of how firms should approach the market. Arguably one of the biggest attractions to this market is the vast availability of cheap labor. This is a double-edged sword, however, because the extent to which these countries can produce relatively high technology products is also limited. Canada and Brazil have highly developed industrial bases. Both countries manufacture complete aircraft and systems, including rotorcraft.29,30 However, their independent technological capabilities are relatively limited. As a result, they are relatively reliant in imports for industrial growth in the A&D sector. As mentioned, this has become a major concern to Brazil who seeks to grow their technical base through joint ventures. The other countries, on the other hand, have relatively limited industrial bases. Able to provide basic MRO functions and limited manufacturing, Mexico, Argentina, Colombia, Chile and Peru are looking to further develop their MRO capabilities and begin component manufacturing. Without robust indigenous capabilities, reliance on imports is very high. To that end, most of the countries actively limit their barriers to entry. This fact can be readily observed through their FDI and offset policies. Argentina, for example, is arguably the most liberal with respect to investment with their policy to actively build industrial partnerships.31 Brazil and Colombia, on the other hand, have significant barriers enshrined in their FDI polices.

In summary, the countries in the Western Hemisphere are chiefly concerned with internal security and counter-narcotics operations. In fact, many of these countries are in continuous low-conflict wars. These dynamics require mission sets ideally suited for rotorcraft. However, the economic environment is prohibitive. Many of the countries cannot afford to procure new equipment. In fact, they are more concerned with handling internal issues like unemployment and building their industrial base than they are projecting their military capability beyond their borders. Even those that can are required to prioritize their defense spending. However, these countries in the region do see opportunity. Most see a "win-win" scenario with respect to defense spending and industrial growth. As such, they are very open to foreign investment and technology transfer, although their ability to absorb such capability would be slow. To that end, the countries have begun building alliances and are eager to develop.

Commonwealth of Independent States (CIS) and Sub Saharan Africa

Because of the sharp increase in political instability and the deteriorating security situation in the two regions, Commonwealth of Independent States and the Sub-Saharan Africa, there are causes for concern. Apart from their humanitarian impact, the conflicts in these two regions will lead to a sharp markdown in their growth prospects. Because of Russia's sharp slowdown and ruble depreciation this has also severely weakened the outlook for other economies in the Commonwealth of Independent States. Despite the heightened geopolitical risks within the region, only six countries which are: Georgia, Kazakhstan, Kyrgyzstan, Tajikistan, Ukraine, and Uzbekistan, comprises the bulk of the helicopter inventory; in turn have a very limited maintenance, repair and operations opportunities, and low future procurement market potential. Looking towards the south, the observed sluggishness in the fiscal imbalances in Sub-Saharan Africa reflects a decay of defense spending in some countries that could imply risks, but does not represent a major source of concern at the regional level. Most countries in Sub-Saharan Africa, such as South Africa, Angola, Nigeria, Kenya, Uganda, and Botswana have maintained focus on the much needed expansion in rotorcraft procurement even while maintaining debt to GDP ratios at sustainable levels. However, only Republic of South Africa would stand out with having any future procurement market potential, and at best, it's marginal.

The key market driver within these two regions is the recapitalization and modernization of old, obsolete Russian helicopters. Assessing the potential rotorcraft market opportunities in the Commonwealth of Independent States and the Sub-Saharan Africa regions, at best, there was only one country that marked at a marginal opportunity, and that's Republic of South Africa. This is unlike the regions in the Northern Hemispheres, Asia Pacific, Middle East & North Africa, and Europe where there tends to be more countries in the high to marginal potential in rotorcraft market opportunities, this is mostly due to having a large to medium defense force and an adequate defense spending budget. Therefore, when assessing Commonwealth of Independent States and the Sub-Saharan Africa regions, only Republic of South Africa seems likely for future market opportunities. As for Republic of South Africa, they have a high technical labor force able to absorb technologies and Maintenance, Repair and Operations (MRO), to include, upgrade capacity. The country has a relatively sufficient defense force and dense budget to acquire new and modernized equipment. They have an indigenous industrial capability, with a state-owned company, Denel Aviation, which has a privileged position in the Republic of South Africa defense industrial base as a sovereign supplier of defense capability. Their current defense strategy requires helicopters and they require the need for procurement of helicopters, and most importantly, they currently do not have any United States helicopters in their inventory. All of which provides a key market opportunity for the United States to gain entry in their rotorcraft

market.

Overall, the Commonwealth of Independent States and the Sub-Saharan Africa regions offer very little for the rotorcraft industry market. The regional security dynamics are weak; the economic/budget outlooks are glim; the Maintenance, Repair and Operations (MRO) and offset are almost nonexistent; the regional market opportunities are minimal; and finally, the growth of industrial alliances within the two regions are at best marginal.

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