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THE GULF RISING
Defense Industrialization in Saudi Arabia and the UAE

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Cover image: A visitor looks at a miniature model of a helicopter on display during the International Defense Exhibition and Conference (IDEX) at the Abu Dhabi National Exhibition Centre, February 18, 2013.

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Foreword

Shrinking budgets and downsized militaries. Those are some of the characteristics of the challenging defense environment in which the United States and its transatlantic friends and allies have to live for the foreseeable future. The long-term viability of many national defense industries in the transatlantic community and around the world is currently in doubt due to increasing political, financial, and fiscal pressures as well as dramatic changes in the world of defense. Even the most advanced US industrial allies are having difficulty pursuing their defense and security goals, and, as a result, they have been forced to make tough choices that have left them even more dependent on the United States or with capability shortages.

In this harsh defense environment, it is hard to see how Saudi Arabia and the United Arab Emirates (UAE)—two modernizing states that have much weaker industrial capacities and scientific-technological bases—can succeed where other, more developed states failed in the past or are currently scaling back or dropping out. Yet with carefully articulated goals, modest expectations, smart strategies, effective financial management, and cooperation with Washington, Riyadh and Abu Dhabi can navigate some of the complexities of military industrialization and overcome some of its key challenges. New technologies, such as unmanned and communications systems and commercially derived technologies, have challenged the existing defense hierarchy. The emerging new defense-industrial base may afford more opportunities for relatively new entrants such as Saudi Arabia and the UAE and make their learning curves a little less steep.

The United States has a strong interest in seeing its Gulf partners succeed in achieving their defense and security objectives. If approached with a healthy dose of rationality, honesty, precision, and foresight, military industrialization can contribute to Saudi Arabia and the UAE's efforts to diversify their economies and promote economic growth. Equally important, it can upgrade their indigenous defense and security capabilities and allow the United States to increasingly rely on them to be security providers in the Gulf.

This report by Bilal Y. Saab, senior fellow for Middle East security at the Atlantic Council's Brent Scowcroft Center on International Security, provides new analysis of and key policy insights on military industrialization in Saudi Arabia and the UAE and adds an important, though often overlooked, dimension to the US policy debate on the US-Gulf partnership.

This effort is part of the Scowcroft Center's Middle East Peace and Security Initiative, launched in 2013 by the Atlantic Council. It directly contributes to the Scowcroft Center's Transatlantic Security Initiative by exploring opportunities for closer defense-industrial cooperation and collaboration between the transatlantic community and partners in the Arab Gulf.

Fred Kempe
President and CEO
Atlantic Council

Executive Summary

Because of their sizeable financial resources, close relations with Washington, and privileged access to the top transatlantic defense companies, Saudi Arabia and the UAE are in a unique position to explore opportunities and make important strides in the military-industrial domain that other countries can simply ill-afford to make. Moreover, over the past decade, globalization and the information technology (IT) revolution in military affairs (RMA) have opened up the international defense market and made it less exclusive, allowing Saudi Arabia and the UAE to overcome some of the key scientific and technological challenges that accompany the building and sustaining of indigenous defense industries.

For Saudi Arabia and the UAE, the creation of modern military industries that could compete in the international defense market promotes a set of domestic and foreign policy interests. Both countries seek to develop their arms manufacturing capabilities to address a range of perceived internal and external national security threats, reduce their political dependence on the United States and other influential powers that dominate the global defense market, diversify their economies, affirm their regional status and prestige, enhance their military credibility, and finally augment their diplomatic leverage.

Self-sufficiency is not a realistic goal for Saudi Arabia and the UAE. But in some limited security and defense areas, including spare parts, ammunition, and potentially shipbuilding (for the UAE), both countries have made steps forward. In addition, they now design, manufacture, and modernize military vehicles, communication and electronic systems, and unmanned systems including drones. They have also significantly upgraded their maintenance, repair and overhaul (MRO) capabilities in the aerospace industry. Because of Saudi and Emirati improvement in such capabilities, the old adage of "Arabs don't do maintenance" no longer reflects reality. Furthermore, both countries' military personnel have drastically enhanced their military training and competency and can now operate some of the most sophisticated weapons systems. They have also steadily increased their defense spending as part of their gross domestic product (GDP) and successfully absorbed some technology transfers.

The development of strategic partnerships with Washington, London, and Paris and some of the leading global defense firms over the years has offered Saudi Arabia and the UAE the opportunity to aggressively pursue defense industrialization. But out of all enabling factors, it is unquestionably both countries' large and sophisticated offset programs, which have emphasized technology transfer, that have contributed the most to their effort to develop their indigenous defense capabilities. Saudi Arabia and the UAE are projected to be among the top twenty global military offset markets for the next decade. Through these offset programs, Saudi Arabia and the UAE have been able to connect their domestic defense sectors with global defense producers and enable them to acquire basic industrial knowledge and know-how. The results are mixed but in some areas

encouraging, as a number of indigenous industries have been established in Riyadh, Abu Dhabi, and other locations in joint ventures with global defense industry giants.

Yet these accomplishments notwithstanding, embarking on a successful path to domestic military industrialization could, depending on the desired objectives, require nothing short of a total state effort and a societal transformation. Political stability, national leadership, and relative abundance of financial capital in Saudi Arabia and the UAE have been crucial to getting military industrialization off the ground, but to develop, rationalize, and sustain the process for the long term both countries stand a better chance of succeeding if they implement the following set of recommendations:

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- ***Clarity of Purpose and Strategy:*** Saudi and Emirati military industrialization must have a more precise strategic and tactical purpose. High-tech and small-scale is the best way forward for both countries, but Saudi Arabia and the UAE ought to think more seriously about ways to effectively integrate the process of local arms production into the broader context of national defense policy and arms acquisition.
- ***Defense Production Policy:*** Riyadh and Abu Dhabi must formulate clear defense production policies and create overarching bodies for long-term defense planning. This is important for consistency between short-term decisions and long-term plans.
- ***Organization of Defense:*** Riyadh and Abu Dhabi must organize their national defense establishments by creating credible and authoritative institutions as well as solid legal and administrative frameworks. If defense ministries in Riyadh and Abu Dhabi assume key defense-related powers and refrain from relegating them to kings or military commanders, military industrialization would profit.
- ***Technology Transfer:*** A diverse approach to technology transfer that addresses actual needs and realities would be most beneficial to Saudi Arabia and the UAE. Riyadh and Abu Dhabi should continue to adopt a deliberate policy of training their nationals and encouraging them to learn skills on the job.
- ***Research & Development and Science & Technology:*** Saudi Arabia and the UAE should develop a more robust local R&D capability that would have more direct interaction with the users—the armed forces and foreign clients. But advances in R&D have to correspond to S&T levels in user organizations. Both countries should also create more dynamic linkages between science institutions (universities, parks, institutes, etc.,) and the defense industry.
- ***Private Sector Participation:*** Saudi Arabia and the UAE need to ensure a greater role for the private sector in funding the enterprise of military industrialization. Otherwise defense production would remain wholly state-owned, which works against the streamlining of defense industrial activity.
- ***Offset Programs:*** Saudi Arabia and the UAE should further integrate their offset programs into national strategies for industrial development. In order to reduce their dependency on external technology suppliers, both countries must maximize the effect of job creation.
- ***Maintenance, Repair, and Overhaul:*** Because Saudi and Emirati technicians and engineers,

as few as they are, are still unable to maintain modern US and other Western weapons systems without the help of foreign workers, further focus on and investment in MRO capabilities is needed in Saudi Arabia and the UAE.

- ***Bilateral or GCC-wide Military Industrial Cooperation:*** Saudi Arabia and the UAE would benefit from developing a joint MRO base and an integrated or complementary services and production infrastructure. This would be hugely profitable economically, as it would allow for maximal exchange of experience and skills, as well as fuller, more prolonged use of facilities and qualified manpower.

Implications for US Policy

Efforts by Saudi Arabia and the UAE over the past decade to upgrade their national defense capabilities by purchasing arms and pursuing domestic military industrialization contribute to US strategic plans and interests in the Middle East and are generally consistent with the broader US commitment to expanding its global partnerships and strengthening its friends and allies' defense capabilities. However, should current political uncertainties in US-Gulf relations persist and, more dramatically, a strategic rift between Washington and Riyadh develop in the future due to major policy differences, intensified defense industrialization in the Gulf could carry risks to US strategic interests in the Middle East.

One of the motivations of Saudi Arabia and the UAE to pursue military industrialization is to reduce their political dependence on the United States. Unilateralism on the part of US friends and allies can sometimes undermine security interests, as evidenced by Israel's unilateral military actions in Lebanon, Syria, and the Palestinian Territories. The United States has often favored and called for regional solutions to many of the Middle East's security problems, and Washington would be relieved if Saudi Arabia and/or the UAE could step up and use their own defense and diplomatic resources to defuse a potential crisis in the future. However, if another *major* crisis, a la 1990-91 Gulf War, occurs and the Saudis and/or the Emiratis decide to act on their own to protect their interests outside the confines of the US-Gulf partnership, US strategic interests might be at risk.

The sustainability of the US-Gulf partnership is a joint responsibility, despite Washington's senior status.

While Saudi Arabia's current *capacity* to act more independently from the United States is lower, its *willingness* will only increase should relations with Washington fail to improve and its defense industrialization effort develop at a more rapid pace. This equation is almost reversed with the UAE. Abu Dhabi's capacity to act more independently from the United States is higher (its armed forces are more technically proficient and combat-ready than the Saudi military) and will only strengthen with time, but its willingness to do so is decreased because it has a stable relationship with Washington and much prefers to work with US-led, international coalitions. This explains why Abu Dhabi is interested in strengthening its partnership with NATO and vice versa. Like Saudi Arabia, the UAE has regional leadership ambitions, but it seeks to lead by example, and its foreign policy outlook tends to be more global and cosmopolitan than Saudi Arabia's.

The sustainability of the US-Gulf partnership is a joint responsibility, despite Washington's senior status. The Arab Gulf countries, and Saudi Arabia and the UAE in particular, have obligations too. Building closer security relationships and integrating national defense capabilities (most importantly in air and missile defense, and intelligence, surveillance and reconnaissance) should be more pressing priorities for Arab Gulf leaders. Interoperability is also not a one-way street. Washington has been adamant about its Gulf partners maintaining compatibility with US defense systems. However, often times, when these partners request the purchase of US items that would uphold US-GCC and inter-GCC interoperability, their requests are denied by

Washington. The two major reasons for this are strict export controls and a US Israel policy of Qualitative Military Edge (QME), which is designed to maintain Israel's regional military supremacy and uphold its deterrence posture. In the Gulf partners' view, the problem is not limited to US rejection but also to Washington's slow or lacking response. Sometimes it takes years to get an answer from Washington for a specific military purchase, and by the time a response is provided the price as well as the needs and circumstances of the Gulf partners would have changed.

But Saudi Arabia and the UAE shouldn't rely solely on US cooperation. There is ample room for defense-industrial cooperation and collaboration between Riyadh and Abu Dhabi and other GCC capitals, be it in manpower, skilled expertise, manufacturing and/or MRO, that can address some deficiencies. The problem is that politics, rivalry, and prestige have stood in the way of such a goal. The United States has been pushing the GCC to think more collectively for some time, but disagreements among its members, be it on Syria, Egypt, or Iran, are real. So long as political discord reigns in the GCC, the US-Gulf partnership, with its defense-industrial component, will never meet its true potential and remain limited to bilateral affairs between the United States and individual GCC members.

Conclusion

Military industrialization in Saudi Arabia and the UAE is a natural consequence of both countries' ambitions to affirm their rising regional status as well as their efforts over the years to modernize their societies and diversify their economies. The pace, scope, and effectiveness of Saudi and Emirati military industrialization efforts will continue to depend, in many respects, on broader societal change in both countries. But it would be misleading to say that the Saudi and Emirati political systems, because of their restrictive attributes—including secrecy, excessive centralization, exclusionism, corruption, and lack of accountability—totally obstruct military industrialization. What matters most when it comes to successful military industrialization is intent, vision, resources, and a set of sound political, economic, and military industrial strategies. Saudi Arabia and the UAE still struggle with the formulation of such strategies, but they are gradually improving and learning from the top defense companies in the world, by way of collaboration and partnership.

It bears repeating that military industrialization in Saudi Arabia and the UAE is a long-term process. Indeed, it is likely to take anywhere between five to fifteen years before either country can effectively export military items en masse and increasingly rely on its own local manpower and arms production capabilities to address national security needs. But Riyadh and Abu Dhabi are careful not to rush the process, and they have every reason to be confident about the future.

About the Author

Bilal Y. Saab is resident senior fellow for Middle East Security at the Brent Scowcroft Center on International Security at the Atlantic Council. He specializes in the politics, security, and defense-industrial affairs of the Middle East, with a particular focus on the Gulf and the Levant. A native of Lebanon, Saab has lived most of his life in and travelled extensively across the region. He has more than twelve years of research, analysis, and management experience in the Middle East. Saab is the founder and editor in chief of *Arms Control and Regional Security for the Middle East,* a unique blog specializing in all things arms control and regional security in the Middle East.

A prolific scholar, Saab is published in a number of peer-reviewed academic journals including *Middle East Journal*, *Nonproliferation Review*, *Journal of Middle East Policy*, *Studies in Conflict and Terrorism*, *Washington Quarterly*, and *World Today*. Saab has also written for global newspapers and online policy journals including the *New York Times*, the *Washington Post*, *Foreign Affairs*, *Foreign Policy*, the *National Interest*, the *Christian Science Monitor*, and the *Baltimore Sun*. He regularly appears on the major media networks including CNN, BBC, NPR and France 24. Saab holds a BA from the American University of Beirut, an MLitt from the University of St. Andrews, and an MA from the University of Maryland, College Park.

Introduction

Domestic military industrialization is an incredibly demanding enterprise that is typically reserved for an elite group of highly advanced nations around the world. But because of their sizeable financial resources, close relations with Washington, and privileged access to the top transatlantic defense companies, Saudi Arabia and the United Arab Emirates (UAE) are in a unique position to explore opportunities and make important strides in the military-industrial domain. Furthermore, today, the global defense market is less hierarchical and exclusive because of globalization and the information technology (IT) revolution in military affairs (RMA). This allows Saudi Arabia and the UAE to overcome or manage some of the key scientific and technological challenges that accompany the building and sustaining of indigenous defense industries.

Self-sufficiency is not a realistic goal for Saudi Arabia and the UAE, but it is Riyadh and Abu Dhabi's ultimate goal and declared state policy. In some limited security and defense areas, including spare parts, ammunition, and potentially shipbuilding (for the UAE), both countries have taken steps forward. In addition, they now design, manufacture, and modernize military vehicles, communication and electronic systems, and unmanned systems including drones. They have also significantly upgraded their maintenance, repair, and overhaul (MRO) capabilities in the aerospace industry. Today, the old adage of "Arabs don't do maintenance" no longer reflects reality.

However, neither country is oblivious to the massive societal, financial, organizational, and technological challenges that stand in the way of their defense vision. Leaders in Riyadh and Abu Dhabi also realize that they won't be the first in the region to put their national defense ambitions to the test. Countries such as Israel, Iraq, Egypt, Iran, and Turkey, considered to be the traditional powers of the Middle East, have preceded Saudi Arabia and the UAE by a couple of decades in their aggressive attempts at domestic military industrialization, only to fail in the second half of the twentieth century to meet their ambitious goals. As a result, they were forced to revise their defense industrial strategies and accept security and/or technological dependency. Saudi Arabia and the UAE hope to learn from the experiences of their neighbors and avoid repeating the same mistakes. They also seem to be aware that at a time of great sociopolitical turmoil in the Middle East and increasing need for strong and continuous investments in sound economic practices and social security, unmet expectations and misallocation of valuable financial resources in the name of long-term defense industrialization could come with a hefty price.

Much has been written about the "military industrial complexes" of Israel, Iraq, Egypt, and, to a lesser extent, Iran and Turkey. This is so because these countries' defense and security sectors are the oldest and largest in the region, and they have played a prominent (and sometimes less than constructive) role in domestic politics

and society. However, far less is known of the military industrial experiences of countries in the Arab Gulf, and specifically Saudi Arabia and the UAE, two rapidly modernizing regional powers in the Middle East. This is surprising, given both countries' comparatively high military spending. Saudi Arabia spends up to 10 percent of its GDP on defense, which is more than any other nation in the region, and is the world's seventh biggest military spender.[1] The UAE is the world's fourth largest arms importer,[2] fields an increasingly capable military, and is a regional leader in command and control of air power. It also has a "frontier"[3] domestic defense hub that exports military items and displays its technologies at major defense exhibitions in several regions around the world.

From a US policy standpoint, it is important to examine the military industrial aspirations and experiences of Saudi Arabia and the UAE, given their strategic partnership with the United States, drastically improved military power, and increased role in the politics and security of the Middle East. Indeed, issues of national defense in Riyadh and Abu Dhabi are hardly local, as they impact US strategic interests and goals in the Middle East. To promote stability and security in the Gulf, the United States needs its Arab partners to effectively share the burden and assume their responsibilities toward the partnership. To that end, the development of indigenous defense capabilities of US partners is crucial.

This report analyzes the separate paths to domestic military industrialization that Saudi Arabia and the UAE have followed over the past decade. It explains the key motivations of both countries in engaging in domestic military industrialization and describes the main challenges they have encountered and accomplishments they have achieved along the way. It concludes with a set of recommendations for both countries as well as the United States while also briefly assessing the implications of Saudi and Emirati military industrialization for US policy and strategic interests in the Middle East. The report benefits from a number of interviews with transatlantic defense industry representatives as well as from the views of participants in a workshop on defense industrialization in Saudi Arabia and the UAE, held at the Atlantic Council on March 13, 2014.[4]

1 Ed Attwood, "Mideast Military Spend Rises amid Global Slowdown," Arabianbusiness.com, April 15, 2013, http://www.arabianbusiness.com/mideast-military-spend-rises-amid-global-slowdown-497975.html.

2 "Emirates Builds Its Own Defense Industry," UPI, March 18, 2013, http://www.upi.com/Business_News/Security-Industry/2013/03/18/Emirates-builds-its-own-defense-industry/UPI-77731363633569/.

3 Guy Anderson, "Offsets in the UAE: Aspirations and Reality," Defence Viewpoints, September 15, 2010, http://www.defenceviewpoints.co.uk/defence-industry/offset-in-the-uae-aspirations-and-reality.

4 "Working Group on Defense Industrialization in Saudi Arabia and the UAE," Atlantic Council, March 13, 2014, http://www.atlanticcouncil.org/events/past-events/working-group-on-defense-industrialization-in-saudi-arabia-and-the-uae.

Motivations

For Saudi Arabia and the UAE, the building of modern national military industries that could compete in the international defense market promotes a set of domestic and foreign policy interests—some tangible, some symbolic—including national security; political independence; economic diversification; prestige; military credibility; and, finally, diplomatic leverage.

National Security: Saudi Arabia and the UAE seek to acquire and manufacture modern weapons to address a range of perceived national security threats. Both states live in a dangerous regional environment and see security threats emanating primarily from two sources: externally from Iran, and internally from al-Qaeda-affiliated terrorists and organized political Islamists who can challenge the legitimacy and reign of the royal families.

For Saudi Arabia and the UAE, the building of modern national military industries that could compete in the international defense market promotes a set of domestic and foreign policy interests—some tangible, some symbolic—including national security; political independence; economic diversification; prestige; military credibility; and, finally, diplomatic leverage.

But if the national security goals of Saudi Arabia and the UAE can be met by *purchasing* the best arms from the United States and elsewhere, it is worth asking why it is necessary for either country to pursue a costly and challenging military industrialization program at home that may not produce optimal results. Also, so long as Saudi Arabia and the UAE are strategically partnered with the United States, their survival should not be at risk, and thus there is little incentive for them to further militarize. It is true that the United States does not have a formal defense pact with either nation, but Washington's commitment to the security of its Gulf partners has never been in doubt (at least in the minds of US policymakers). Indeed, a major reason why Iran does not contemplate overt coercion or military attack against its Gulf neighbors is because of the US-Gulf partnership.

Yet such a partnership notwithstanding, there is no substitute for indigenous defensive capabilities. The ability to build powerful weapons at home to withstand a surprise attack, a massive invasion, or any type of major and prolonged military conflict is of utmost strategic significance. Furthermore, the current political environment in the region is especially unstable and the US-Gulf partnership is experiencing turbulence and uncertainty due to

lack of trust primarily from the Gulf side. This has heightened threat perceptions in Riyadh and Abu Dhabi and has caused Saudi and Emirati leaders to start thinking more independently and beyond their US protector.

While Iran is not at war with Saudi Arabia and the UAE, tensions do exist. Tehran has a fierce rivalry and regional proxy confrontation with the former and an old territorial dispute with the latter over the islands of Abu Musa and Greater and Lesser Tunb that has yet to be resolved.[5] These factors alone provide an additional impetus for Saudi Arabia and the UAE to develop indigenous arms industries, especially if strains in the US-Gulf partnership persist. Iran's notable capabilities of its own in local arms production (specifically in the areas of ballistic missiles and unmanned systems) further increases the incentives of the Saudis and the Emiratis to match and possibly surpass their rival. In this context, military industrialization follows a familiar "action-reaction" process, similar to arms races.[6]

Political Independence: Self-sufficiency in defense and security, even though it may never be *fully* realized, is an important way for Saudi Arabia and the UAE to reduce their political dependence on the United States and other influential powers that dominate the global defense market.[7]

"Every country aims to achieve 100 percent local production of weapons to ensure independent political decisions and avoid surprises during armed conflicts," Saudi Prince and Assistant Minister of Defense and Aviation for Military Affairs Khalid Bin Sultan said on February 13, 2010.[8] Tareq Al Bannay, staff colonel pilot of the UAE armed forces, told a local newspaper on February 21, 2013, "We are doing our best to be self-sufficient through joint ventures that provide our national cadres with sufficient knowhow and knowledge to invent equipment and devices that meet our future needs."[9]

For Saudi Arabia and the UAE, local arms production is also meant to reduce the impact of US supply constraints and export controls on Saudi and Emirati foreign and military policy, although as will be discussed later, *technological* dependence on foreign suppliers will continue to limit both countries' ability to pursue truly independent foreign policies. US export control policies that affect Saudi Arabia and the UAE (and other Arab partners) target a range of missiles, combat fighter radar, and electronic warfare systems. Despite their partnership with the United States, Gulf Cooperation Council (GCC) states face important restrictions when it comes to purchasing arms from Washington, although some improvements have recently been made in part due to US President Barack Obama's initiation of reforms.

Economic Diversification: Saudi Arabia and the UAE see the pursuit of domestic military industrialization as another important means to reach the vital goal of economic diversification.

According to Abu Dhabi's Economic Vision 2030,[10] Emirati rulers hope to transform their country's economy and make it free from dependence on oil exports by 2030.[11] It is an ambitious vision, but

5 Bilal Y. Saab, "Swapping Sovereignty: Can Iran and the UAE Make a Deal?," *Foreign Affairs*, January 19, 2014, http://www.foreignaffairs.com/articles/140661/bilal-y-saab/swapping-sovereignty.

6 David Kinsella, "Forces Driving Third World Military Industrialization: Interests and Passions," paper presented at the annual meeting of the International Studies Association, April 17-21, 1996, San Diego, California.

7 Reducing dependence on outside powers was precisely the objective of the Arab states when they formed the Arab Organization for Industrialization (AOI) in 1975. However, the Egypt-led initiative, still active but now purely an Egyptian venture owned by the state, has not lived up to its promise due to turf battles and political differences amongst Arabs following the 1979 Camp David peace treaty between Egypt and Israel as well as profound lack of bureaucratic organization and financial management. For a good profile of AOI, see Omar Halawa, "Profile: The Arab Organization for Industrialization," *Egypt Independent*, September 5, 2012, http://www.egyptindependent.com/news/profile-arab-organization-industrialization. The official website of AOI is http://www.aoi.com.eg/aoieng/.

8 "Saudi Official Says Kingdom Seeks Self-sufficiency in Arms Production," BBC Monitoring Middle East, February 14, 2010.

9 Shehab Al Makahleh, "UAE Defense Industries Show Significant Progress," *Gulf News*, February 21, 2013.

10 Masdar City, http://masdarcity.ae/en/28/abu-dhabi-economic-vision-2030/.

11 Tony Osborne, "UAE Industry Builds Capability," *Aviation Week & Space Technology*, March 4, 2013.

one that Abu Dhabi is confident it can achieve. So far, the UAE has done a better job than its oil-producing neighbors in diversifying its sources of revenue. Such diversification efforts include large scale sustainable energy projects such as Masdar,[12] tourism (the most notable success in this sector being the Dubai Healthcare City established in 2012), and biotechnology, which grew from Dubai's DuBioTech,[13] a major biotechnology and research park.

But military industrialization in the UAE is also proving to be another engine for this drive toward economic diversification. According to the Statistics Centre-Abu Dhabi (SCAD), "public administration, defense and compulsory social security accounted for 23.5 per cent of Abu Dhabi's labor force in 2011, employing 6 out of 10 nationals."[14]

Diversification of the production base is also of paramount importance to Saudi Arabia's national economy (which is the largest in the Middle East North Africa region), and improving the skill levels of workers is an objective that the Saudi government has been emphasizing in official policy for more than thirty years. According to the Kingdom's 2025 Economic Strategy (also called Long-term Strategy 2025), Saudi development plans have consistently focused on upgrading the role of non-oil sectors in the national economy. Like its Emirati counterpart, the Saudi private sector has played a modest role in spurring economic growth and reducing unemployment. According to the International Monetary Fund (IMF), in 2012 Saudi Arabia had an overall unemployment rate of 5.8 percent, which has remained broadly stable since end-2009. However, many jobs—especially recently created jobs—are filled by foreigners. Among Saudis, unemployment rates are higher and have risen from 10.5 percent at end-2009 to 12.1 percent at end-2012, and rates are especially high for youth and women.[15]

However, despite the various achievements in Saudi diversification over the years, much remains to be done, especially in the fields of natural gas, mining, and tourism. It should be noted that while Saudi Arabia produced around 10 million barrels of oil a day in 2011, the country has the lowest GDP per capita among the GCC countries. Youth unemployment, low living standards, and growing poverty are some of the problems that the Kingdom has been wrestling with for years. Despite the emphasis of successive Saudi development plans on increasing the role of the private sector, and despite the sector's contribution of roughly 59 percent to the GDP in 2013,[16] the Saudi economy is not market-driven and a significant part of economic activity still relies upon public sector spending.

Prestige: The importance of manufacturing arms locally, and specifically symbolic arms, is nothing new in the history of warfare. During the Cold War, the notorious, albeit imagined, US "window of vulnerability" in relation to the Soviet Union had faulty strategic logic and was based primarily on notions of honor and prestige. The Soviets were guilty of such thinking as well. Their obsession with large and heavy land-based, nuclear-tipped missiles also had a symbolic element as these weapons were not just meant to deter but also terrorize the US adversary and showcase Soviet capability in missile technology. Today, regional prestige plays a big part in the developing space race and rivalry in Asia between India and China, Japan and China, and the two Koreas.

In the Middle East, prestige carries considerable influence in political and military relations, and thus should be accounted for when explaining state behavior. In the case of the Arab Gulf states, a

12 Masdar City, http://www.masdar.ae/en/#masdar.

13 Dubai Biotechnology & Research Park, http://www.dubiotech.ae/.

14 "Abu Dhabi: Key Role for Defence in Diversifying Efforts," Oxford Business Group, April 16, 2013.

15 IMF, *Saudi Arabia: Selected Issues* (Washington, DC: IMF, July 2013).

16 Khalil Hanware and P.K. Abdul Ghafour, "Private Sector GDP Contribution to Exceed 58.75%," *Arab News*, December 24, 2013.

full understanding of their reasons for purchasing certain types of ultra-modern weaponry from the United States or elsewhere requires an assessment of the role of prestige and regional status affirmation in their decision-making. Defense analyst Anthony Cordesman has often criticized this phenomenon in military sales in the Arab Gulf by calling it the "glitter factor,"[17] meaning that the Arab Gulf states often prioritize modernity and size in their defense purchases over effectiveness and systems integration. This "policy of prestige,"[18] as German theorist Hans Morgenthau once called it, is intended to convince the adversary—in this case, Iran—of a state's military capabilities and national power.

Beyond defense sales, building modern arms domestically and getting recognized by the international community for technological and scientific advances enhances national prestige. Held in Abu Dhabi biannually, the International Defense Exhibition and Conference (IDEX) allows the UAE to purchase state-of-the-art military equipment from major defense companies participating in the event, but it is also an excellent opportunity for the UAE to showcase its own defense industrial accomplishments and hence raise its military profile and international prestige.

Military Credibility: As the two defense heavyweights within the GCC, Saudi Arabia and the UAE have every interest in displaying military power regionally and showing their US partner that they can be relied on in matters of defense and security. Purchasing arms from the United States and training with US military personnel plays a huge role in solidifying the US-Gulf partnership. But building an indigenous and modern defense sector that can design and produce, through joint ventures with major US companies, sophisticated defense systems instills even greater US confidence in Saudi and Emirati capabilities and responsibilities toward the partnership. Saudi Arabia and the UAE have also accelerated their efforts to enhance their ability to operate sophisticated systems. For example, UAE operators of HAWK surface-to-air missile batteries seem to be "on par with their American counterparts," according to a US Congressional Research Service report.[19] The Emirati fighter pilots are "combat ready," as demonstrated in military operations in Libya in 2011 and in their recent successful completion of the Red Flag exercise—a realistic combat training exercise involving the air, space, and cyber forces of the United States and its allies and partners—in Nevada.[20] This all adds muscle and credibility to the UAE partnership with the United States. The same can be said about Saudi advances in military training, operability, integration, and performance since the First Gulf War.

Diplomatic Leverage: Strong militaries bring diplomatic leverage to their civilian leaders, but the defense industrial sector also lends weight to the state's diplomatic efforts. Defense industry specialist Stephanie Neuman sums up the military power increments and the diplomatic leverage the US defense industrial sector provides: "The defense industrial sector is a powerful, if less recognized, diplomatic tool in the United States' political arsenal."[21] A state's possession of a well-oiled defense industrial machine that can produce powerful weapons efficiently can deter adversaries from waging war or change their cost-benefit calculations and military strategies. Saudi Arabia and the UAE's defense industrial capabilities are very modest at present. Therefore whatever diplomatic leverage they might generate is likely to be minimal if not nonexistent. But Riyadh and Abu Dhabi hope that with time, such capabilities will develop and achieve their desired effects.

17 Anthony H. Cordesman, "Security Challenges and Threats in the Gulf: A Net Assessment," Center for Strategic and International Studies, March 24, 2008, http://csis.org/publication/security-challenges-and-threats-gulf-0.

18 Hans J. Morgenthau, *Politics Among Nations*, 2nd ed. (New York: Alfred A. Knopf, 1954), p. 74.

19 Kenneth Katzman, *The United Arab Emirates (UAE): Issues for U.S. Policy* (Washington, DC: Congressional Research Service, August 20, 2013).

20 Ibid.

21 Stephanie G. Neuman, "Power, Influence, and Hierarchy: Defense Industries in a Unipolar World," in Richard A. Bitzinger, *The Modern Defense Industry: Political, Economic, and Technological Issues* (Santa Barbara, CA: Greenwood Publishing Group, 2009), pp. 60-61.

Pillars

Although there is no linear path to or universal formula for success in domestic defense industrialization, some pillars, or critical attributes, must be made available to get off on the right foot and sustain the process. These include, but are not limited to, political stability; wise national leadership; strong institutional capacity; human development (education, scientific and technical manpower, research and development); a civilian industrial base; an information base; investment in science and technology; and a viable defense production policy. Financial capital, without which the creation of a domestic defense industry is virtually impossible, is deliberately excluded from this list because it exists in relative abundance (at least for the foreseeable future) in the cases of Saudi Arabia and the UAE due to massive oil revenues.

Political Stability: To the extent that political stability permeates all aspects of public life, its existence is especially important in the realm of economic and industrial development because it provides a level of predictability to *long-term planning* and improves the business climate for domestic and foreign investment, both of which are essential to domestic defense industrialization.

While the political systems of Saudi Arabia and the UAE are undemocratic, neither country has witnessed dramatic political turmoil since its independence, making them among the most politically stable in the region. Such a conclusion, of course, should be stated with caution and humility given the present realities of the Middle East and the acute crisis conditions that the Arab uprisings have generated over the past three years.

In the case of Saudi Arabia, stability has largely been the product of the ruling family's immense financial capital and its effective political and economic strategies at home that have created large patronage systems and consolidated power over time in the hands of Al Saud. But potential threats to regime survival in the Kingdom have always existed, and arguably it all starts with economics. As enormous as Saudi Arabia's petroleum reserves are, oil remains a finite commodity and cannot be solely and indefinitely counted on to sustain a national economy and stabilize politics. Also, a sharp and continuous reduction in the price of oil could lead to an economic crisis that would massively degrade the Kingdom's ability to effectively provide for its populace and maintain its support base, which could potentially lead to a popular uprising. Politically, a potential split within the ruling family could create problems and open the door to destabilizing, contentious politics in the Kingdom. Youth discontent over unemployment and lack of meaningful reform over the years are two other factors that Riyadh should be addressing more seriously before they explode. From a security standpoint, another militant Islamist insurrection against the rule of Al Saud, such as the one waged by Osama bin Laden's al-Qaeda in 2004, is not unthinkable. Indeed, given the current radicalization trends in the region and the spillover from Syria, such an insurrection is likely. Last but not least, a direct or proxy war

with Iran on Saudi soil that could trigger a massive Shia revolt in the Eastern Province is always a possibility. However, as real as these threats are, arguably none is imminent, and the Kingdom's "underlying sources of strength and control," as Gulf analyst Gregory Gause put it, have stood the test of time and are likely to continue to provide stability for years to come.[22]

Although the UAE's political system is more predictable than Saudi Arabia's, the country has to be concerned about several issues that could threaten its political stability in the foreseeable future. As one of the more open economies of the Gulf, the UAE is particularly exposed to the risk of global market disruption and capital flight. Dubai's economic collapse in 2009 following the international credit crisis is still fresh in the collective memory of Emiratis and particularly Abu Dhabi, which ended up bailing out its sister emirate. Like Saudi Arabia, the UAE also has to keep a close eye on Islamic political activism at home, and specifically political groups that may be associated with the Muslim Brotherhood. Domestic terrorism caused by extremist groups is a concern as well, although the country has been spared the level of sectarian violence and Islamist radicalization that some regional states have been suffering from. Also similar to Saudi Arabia, the UAE sees a political and military threat in Iran and the fact that the two countries have a long territorial dispute over the islands of Abu Musa and Greater and Lesser Tunb is a perpetual source of concern for Abu Dhabi. But in the interest of preserving its security interests, the UAE has been pragmatic in its dealings with Iran. Indeed, the UAE was one of the first countries in the region to welcome the nuclear agreement with Iran in November 2013.

Since then, a couple of high-level meetings between Iranian and Emirati officials have taken place in Iran and the UAE, covering a range of issues from trade and security to the islands dispute. Importantly, in a meeting in early December with UAE ruler Sheikh Khalifa Bin Zayed Al Nahyan in Abu Dhabi, Iranian Foreign Minister Javad Zarif said that Iran hoped to "institutionalize" ties with the UAE.[23]

National Leadership: Domestic military industrialization requires highly capable individuals at the top of the political pyramid who are willing to commit a sufficient amount of material and human resources to start and sustain this long-term enterprise. While Saudi Arabia and the UAE do not need another Muhammad Ali of Egypt or Abbas Mirza of Persia to create large and powerful armies, the kind of skilled and visionary leadership that these two historical Middle Eastern figures exhibited in the past can help turn Saudi and Emirati defense ideas into reality.

Political leadership has not been lacking in the UAE, and this has arguably been the country's most critical national asset. In no areas has such leadership been better demonstrated than in the fields of economic development, technological evolution, and industrial modernization, including national defense. Much credit goes to Sheikh Zayed Bin Sultan Al Nahyan, the late (and first) president of the UAE, whose leadership, as judged by his own public and peers who often refer to him as "father of the nation," played a big role in forming the federation in 1971 and laying the foundations for the country's future success. Following his death in November 2004, his son Sheikh Khalifa was appointed as president by the UAE Federal Council.[24]

22 F. Gregory Gause III, "Kings for All Seasons: How the Middle East's Monarchies Survived the Arab Spring," Brookings Doha Center Analysis Paper, no. 8, September 2013, p. 2.

23 "Iran Eyes Better Ties with UAE After Nuclear Deal with West," Reuters, December 4, 2013.

24 Sheikh Khalifa's leadership has been revealed in his commitment to expanding the citizenry's participation in public life, implementing a range of socio-political and economic reforms, promoting entrepreneurship, creating a secure climate for business, supporting a strong regulatory framework, and investing in education and health infrastructure.

Sheikh Khalifa Bin Zayed Al Nahyan

Sheikh Mohammed Bin Zayed Al Nahyan

Sheikh Mohammed Bin Rashid Al Maktoum

In the area of defense, Abu Dhabi's military industrialization plans reflect to a large extent the vision of Sheikh Khalifa and General Sheikh Mohammed Bin Zayed Al Nahyan, Crown Prince of Abu Dhabi and Deputy Supreme Commander of the UAE Armed Forces. Trained at Sandhurst, the prestigious British Royal Military Academy in Surrey,[25] he has been incremental in pushing modernization across various sectors inside the country.[26] Although his brother is president and ultimate ruler of the country, Sheikh Mohammed is in many ways the man who "runs the show" in the UAE.[27]

Saudi leaders have also actively pursued their national defense vision and promoted, to the extent possible, the kinds of changes—cultural, scientific, economic, and political—that will help achieve successful domestic military industrialization. The effort to speed up the development of a Saudi defense industry is most associated with the late Saudi Defense Minister Prince Sultan Bin Abdulaziz, who died in 2011, and son Prince Khalid Bin Sultan, removed as deputy defense minister earlier in spring 2013.[28] But uniquely challenging political variables in the Kingdom—what some might call "structural impediments"—will make it difficult for Saudi leadership to outperform or match the accomplishments of their Emirati counterparts in the area of defense industrialization.

Even though Saudi Arabia and the UAE are both monarchies, they have vastly different political processes. There is excessive centralization of power in the hands of Al Saud in the Kingdom, whereas in the UAE the federal system of power-sharing, while by no means democratic or inclusive, allows for a small degree of devolution of power and greater political access to the citizenry. In contrast to their Emirati counterparts, Saudi Arabia's rulers are more preoccupied with balancing alliances between domestic and foreign actors than with actually *leading* and proposing new and bold national initiatives. Age is another factor when assessing leadership, creative thinking, and quality of governance. Saudi leaders are older and arguably less in tune with the latest global trends than the Emirati ruling generation is.

Institutional Capacity: The organization of national defense requires credible and authoritative institutions as well as a solid legal and administrative framework (the same can be said about the organization of science, which is crucial for the effectiveness of R&D).

25 A number of Saudi royals, including General Khaled Bin Sultan, the Joint Forces Commander during the 1990-91 Gulf War, have attended Sandhurst.

26 He also founded the Abu Dhabi Education Council (ADEC), which focuses on developing the educational system of Abu Dhabi.

27 Margaret Coker, "Leaked Papers Show Arab Leaders Critical of Iran, Neighbors," *Wall Street Journal*, November 29, 2010.

28 Ellen Knickmeyer, "Saudi Stays the Course on Defense Spare Parts Industry," *Wall Street Journal*, July 3, 2013.

Prince Sultan Bin Abdulaziz

Prince Khalid Bin Sultan Bin Abdulaziz

Prince Salman Bin Abdulaziz

That overall institutional capacity in Saudi Arabia and the UAE is relatively weak poses a challenge to the future of defense industrial activity in both countries. Regardless of the level of competency and creativity exhibited by national leadership, defense industrialization requires the smooth and rational functioning of a set of government bodies, bureaucracies, and institutions that are strong, well-staffed, and civilian-led. Without such organizations that are "tasked with devising and managing defense policies as well as exerting oversight on military operations," and without a "structured relation between political leaders and military personnel that induces stable and supportive encounters," Riyadh and Abu Dhabi's defense industrial sectors will not achieve optimal results.[29]

The defense institutional context in the UAE lacks transparency, but that happens to be the norm in the Middle East and other developing regions. What is known, however, is that UAE procurement requirements are determined by the Army General Staff's procurement committee, according to Federal Decree No. 12 of 1986. Presumably, this is done in conjunction with the relevant branches of the military. However, it is unclear how this works in practice. There is also no evidence that the Federal Council or the Interior and Defense Committee in the Parliament have meaningful influence over and scrutiny of defense policy.

The defense institutional picture in Saudi Arabia is slightly more promising than in the UAE, but the Kingdom still has some glaring weaknesses. In an effort to upgrade its defense institutional capacity and rationalize the process of military organization and industrialization, Riyadh created in February 2010 a Central Committee for Local Industrialization. The body includes business leaders and defense officials and encourages them to "develop local capabilities, ensure speedy deliveries and reduce costs," according to Col. Attiyah.[30] A year later, Saudi Prince Khalid Bin Sultan Bin Abdulaziz announced that the Saudi Armed Forces Command had created a new General Department to be in charge of local industrialization and technology transfer.[31] And on July 2, 2013, the Saudi Council of Ministers, chaired by Crown Prince Salman Bin Abdulaziz, deputy prime minister and minister of defense, approved a new law for regulating the General Organization for Military Industries (GOMI). "The government military and security bodies shall give priority to GOMI when they intend to purchase their needs of arms, ammunition, equipment, machinery, and vehicles as well as services that fall within the organization's activities," the Saudi

29 David Pion-Berlin, "Defense Organization and Civil-Military Relations in Latin America," *Armed Forces and Society*, vol. 35, no. 3, April 2009, p. 563.

30 Souhail Karam, "Saudi Arabia Opens Military Supply to Local Firms," Reuters, February 7, 2010.

31 "Saudi Army Creates New Department for Local Military Industrialization," BBC Monitoring, January 19, 2011.

Saudi and Emirati advances in human development over the past decade are notable and praiseworthy, but substantial gaps remain in some areas and filling them will require further time and investment.

cabinet said. According to the new law, GOMI will be an independent organization reporting to the minister of defense. "The main purpose of GOMI shall be to support [national security] by creating sophisticated military industry to meet the needs of all military sectors," the cabinet said.[32]

Human Development: The human element is undoubtedly the most indispensable variable in military organization, modernization, and industrialization. Saudi and Emirati advances in human development over the past decade are notable and praiseworthy, but substantial gaps remain in some areas and filling them will require further time and investment. Saudi and Emirati leaders are not shy to admit that their populations lack, both quantitatively and qualitatively, trained human resources. Speaking at IDEX 2013, UAE Vice President Sheikh Mohammed Bin Rashid Al Maktoum underscored the critical importance of the human factor, "I consider our national qualified human resources as the most important element in establishing the success of our exhibition industry."[33]

For military-engineering staff, this considerable human limitation makes it especially challenging to not only operate and maintain highly complex defense equipment purchased from foreign sources but also to design, manufacture, and maintain defense items locally. The composition of the Saudi and Emirati armed forces illustrates most vividly the human resources challenge in both countries. Consider this: during the First Gulf War, "the Saudi army under the US Joint Forces Command comprised of two National Guard battalions, a squadron of Tornado airplanes and a mechanized brigade of 5,500 men. Virtually all were Pakistanis..."[34] More than two decades have passed but little has changed since. Saudi Arabia still relies heavily on Pakistani and other foreign army recruits and engineers to fulfill the Kingdom's defense and security goals. In the UAE, more than 30 percent of the country's 65,000-man armed forces are expatriates (the UAE Air Force and Navy are the most "nationalized").[35]

Saudi Arabia has a much larger pool of human resources to pick from for its armed forces and defense industrial sector than the UAE given the size of its local population. There are a little less than 1 million local Emiratis in the UAE, whereas there are around 20 million local Saudis in the Kingdom. However, it still has a massive *qualitative* deficit. There simply aren't enough engineers, scientists, managers, administrators, manufacturers, trainers, and skilled military personnel both in Saudi Arabia and the UAE. The causes of that are numerous, but a lot of it has to do with suboptimal educational training and limited R&D.

Education: Educational training in science and technology (S&T) is essential to military industrialization. Saudi Arabia and the UAE have made a lot of progress over the past decade in education, and specifically S&T education, but like the rest of the Arab world, they still lag behind.

One of Saudi Arabia's key challenges and priorities for the future is to further develop and open up its educational system in order to meet international standards. At present, Saudi Arabia lacks an independent knowledge sphere, in which

32 "Shot in the Arm for Military Industries," *Arab News*, July 2, 2013.

33 "International Defense Exhibition Conference to Begin 17 February in UAE," BBC Monitoring, February 17, 2013.

34 Nadim Hasbani, "The Geopolitics of Weapons Procurement in the Gulf States," *Defense & Security Analysis*, vol. 22, no. 1, March 2006, pp. 73-88.

35 Sean Foley, "The UAE: Political Issues and Security Dilemmas," *Middle East Review of International Affairs (MERIA),* vol. 3, no. 1, March 1999. Hasbani, "The Geopolitics of Weapons Procurement in the Gulf States."

knowledge can be produced and shared without political interference. If the Saudi government is really serious about its modernization and military industrialization plans, it has an obligation to create and nurture an inclusive environment that would allow and encourage Saudi nationals to be creative and entrepreneurial and to assemble freely—all requirements for innovation and S&T development.[36]

In a country like Saudi Arabia where over 50 percent of the population is below twenty-five years, it is difficult to overstate how important education is. That government funding for education has increased dramatically in the last four years and that the Saudi Education Ministry has a ten-year strategic plan (2004-2014) to overhaul the education system are tangible signs of improvement and better things to come. The education budget grew from $28 billion in 2008, $32.5 billion in 2009, $36.5 billion in 2010, and $40 billion in 2011 to the highest amount ever of $54.4 billion in 2012 and another $54.4 billion in 2013.[37] According to a study by Saleh Abdul Kareem, an associate professor at the Department of Curriculum and Instruction at King Saud University, the budget for education in 1970 amounted to 9.8 percent of the total budget, while the literacy rate was 15 percent for men.[38] Currently, Saudi spending for education occupies 25 percent of the total budget and the literacy rate has reached 96 percent.[39]

To better educate and train its national manpower, Saudi Arabia has partnered with UNESCO's Technical and Vocational Education and Training (TVET), which specializes in developing national technical and vocational training programs.[40] Through the TVET program in Saudi Arabia, 50 Technical Colleges, 50 Girls' Higher Technical Institutes, and 180 Industrial Secondary Institutes will have been completed by 2017.[41] TVET's strategy in Saudi Arabia contributes greatly to the government's military industrialization plans because it trains Saudi youth in necessary vocational professions such as information technology, medical equipment handling, and mechanical and electrical engineering.

Like Riyadh, Abu Dhabi takes education seriously. In a recent interview, Sheik Nahyan Bin Mubarak Al Nahyan, the UAE's former education minister and present cultural minister, said: "We are focused on building a knowledge-based economy. We are investing in our people, who will drive our economy and society forward as global trends shift."

To illustrate how quickly and effectively the UAE has developed its education sector over the years, one must examine education levels in the early 1970s when the UAE federation was formed. In 1971, there were only seventy-four public and private schools in the UAE. In 2013, there were 1,200. There were also no universities in 1971. Today, according to Abdullah Al Awadhi, who consults for the UAE National Human Resources Development and Recruitment Authority, the UAE hosts seventy-three universities and colleges with tens of thousands of students enrolled.[42] In terms of government spending, the UAE plans to spend

36 The benefits of further Saudi investment in education are not limited to military industrialization. A strong educational sector contributes significantly to national development goals and modernization plans, supports the private sector, reduces national unemployment and the economy's current reliance on foreign labor, capitalizes on the present oil wealth, and speeds up economic diversification efforts. Be it in defense or any other sector, ensuring that highly qualified Saudi workers with relevant skill sets are available in an innovative economy is crucial to the Kingdom.

37 The budget includes plans to build 610 new schools in addition to the 3,200 already under construction.

38 Irfan Mohammed, "Saudi Academics Hail King's Vision for Holistic Education," *Arab News*, December 25, 2013.

39 "Saudi Arabia's Literacy Rate Reaches 96 Per cent," *Economic Times*, September 2013.

40 "Saudi Arabia," World TVET Database, UNESCO-UNEVOC, June 21, 2012, http://www.unevoc.unesco.org/worldtvetdatabase1.php?ct=SAU.

41 Ibid., "Current and ongoing reforms, projects, and challenges," http://www.unevoc.unesco.org/worldtvetdatabase1.php?ct=SAU&ct2=&ct3=&disp=6.

42 Abdullah Al-Awadhi, "Education and Information Technology in the UAE: Realities and Need for Development," Emirates Center for Strategic Studies and Research, September 30, 2012.

about 21 percent of its $12.5 billion federal budget of 2014 on general and higher education sectors.[43]

The UAE has sought to develop its technological capabilities by establishing in 1988 the Higher Colleges of Technology (ICT), the largest higher educational institution in the country. According to its official website, "HCT offers many different, work-relevant, English-taught programs in Applied Communication, Business, Computer & Information Science, Engineering Technology, Health Sciences and Education at various levels."[44] Al Awadhi provides a glimpse of the state of technology learning in the UAE by looking at enrollment figures for the 2012-2013 academic year. He writes: "the number of male and female students studying in various disciplines of engineering and health sciences, spread across 17 faculties, stands at 6,265. It should be noted here that these figures relate to various highly specialized disciplines linked to technology, such as applied sciences in biomedical engineering technology, chemical and civil engineering technology, aviation industry technologies, etc."[45]

Scientific and Technical Manpower: If education is input, scientific and technical manpower is output. A country can have a strong education sector and extremely high literacy rates, yet still end up with a deficit in trained and skilled manpower, and as a result face major challenges in military industrialization. As mentioned in the previous section, the role of institutes of higher education—universities, polytechnics, and technical colleges—and vocational and technical secondary schools is very important but insufficient. In most industrialized nations, the bulk of technicians are produced not by formal educational institutions but through "localized outfits designed to provide on-the-job training or apprenticeship."[46] Such arrangements are rare or virtually nonexistent in Saudi Arabia and the UAE. One example in the UAE, however, is the Tawazun Training Center (TTC), which trains both nationals and expatriates in the field of industry. TTC has technician and manufacturing programs, engineering programs, and post engineering programs. Some of these programs include educational programs that combine training and on-the-job experience to build a talent pool of trained mechanical and electrical engineers.[47]

Saudi Arabia and the UAE have made much progress in the education-vocational sector, but it will take another five to ten years at least for the investment to pay off and have positive effects on military industrialization efforts. At present, there simply aren't enough graduates with technical degrees and/or training who can be employed in arms production and maintenance. Not only does this manpower shortage negatively affect arms production, it also "seriously undermines critical support services such as maintenance and repairs both in industry and in user sectors."[48] In a study on Arab defense industry, Middle East security analyst Yezid Sayigh writes that "there should be a ratio of up to one hundred technicians to every engineer in industry, in order to achieve full results in terms of volume and quality (as well as overall efficiency) of production."[49] Yet Saudi Arabia and the UAE (and the rest of the Arab world) are not close, neither in relative nor in absolute terms.

Research & Development: R&D is at the heart of a knowledge-based economy and any military industrialization process. To successfully absorb foreign technology and manufacturing know-how the recipient country must invest in R&D and develop its local capacity. Without an indigenous scientific R&D base, innovation at the national level is likely to suffer and the transition to the production of high-tech military products becomes virtually impossible. The R&D base in Saudi and

43 Tom Arnold, "UAE Cabinet Approves Federal Government Budget of Dh46 Billion for Near Year," *National*, October 27, 2013.

44 "HCT Overview," Higher Colleges of Technology, http://www.hct.ac.ae/about/overview/.

45 Al-Awadhi, "Education and Information Technology in the UAE."

46 Yezid Sayigh, *Arab Military Industry: Capability, Performance and Impact* (London: Brassey's, 1992), p. 32.

47 TTC, http://www.ttcuae.ae/our-programs.aspx.

48 Sayigh, *Arab Military Industry*, p. 189.

49 Ibid, p. 190.

Emirati societies (both civilian and military) has come a long way since the 1970s and 1980s, but it remains relatively weak. It is not just an issue of lack of funding and manpower, it is also one of organization and structure. Although no public information on Saudi and Emirati military R&D is available, it is believed to be limited, according to Gulf insider sources.[50]

The UAE set up a National Research Foundation (NRF) in 2008 whose vision is to "support world-class research activities, and create an internationally competitive research environment and innovation system in the United Arab Emirates."[51] Its mission is to "build an internationally competitive research capacity for the economic and social development of the United Arab Emirates."[52] The NRF offers research grants and awards on a competitive basis, but only a few of the past winners were S&T. According to a March 2012 INSEAD study, "only 13 per cent of UAE university graduates earn science degrees."[53]

Like the rest of the Arab world, Saudi Arabia and the UAE lag behind in science publications, have an insufficient number of R&D centers, employ too few people in R&D, and spend nowhere near the world average on R&D. Within the region, while Israel spends 9 percent of its military budget on R&D, Saudi Arabia, whose per capita GDP is the fifth highest in the region, ranked second to last in 2007 in terms of R&D spending as a percentage of GDP. The Kingdom's rate in 2009 was 0.08 according to data from the World Bank. By contrast, Organization for Economic Cooperation and Development (OECD) countries devote about 2.2 percent of GDP to R&D.[54] The number of scientific and technical journal articles Saudi Arabia produced that year, according to the World Bank, was 710.20, which is comparatively very low even within the region.[55] World Bank statistics show that the UAE spent 0.47 percent of its GDP on R&D in 2011,[56] which is five times more than what Saudi Arabia spent, but still is inadequate for the demanding goal of military industrialization.

Unemployment within the Saudi and Emirati R&D community (and in the Arab world) is high, especially among women researchers, who constitute around 35 percent of the total Arab researcher community, according to estimates by the UNESCO Institute for Statistics.[57] UNESCO's *Science Report 2010* assesses the poor state of R&D in the Arab world and concludes that "Arab universities and research centers have been unable to develop a smart R&D environment over the past four decades."[58]

Civilian Industrial Base: Military industrialization rests on the existence of a civilian industrial base. Without a large and differentiated industrial base, local arms production, at least on a large scale, cannot be achieved. Only those countries that fully appreciate the dynamic linkages between the military and civilian industrial sectors and come up with coherent industrial strategies succeed at military industrialization.

50 Egypt sought to establish a large and diversified R&D infrastructure for its ballistic and fighter programs in the 1960s. Under Saddam Hussein, Iraq employed many foreign experts and acquired a good amount of technology, which indicated that the country might have been developing its R&D effort before the 1990-91 Gulf War.

51 "Vision and Mission," UAE National Research Foundation, http://www.nrf.ae/visionmission.aspx.

52 Ibid.

53 "Measuring Innovation and R&D in the UAE," INSEAD, Innovation and Policy Initiative, March 28, 2012.

54 "Research and Development Expenditure (% of GDP)," World Bank, http://data.worldbank.org/indicator/GB.XPD.RSDV.GD.ZS; *SIPRI Yearbook 2011, Armaments, Disarmament and International Security* (Oxford: Oxford University Press, 2011), p. 237.

55 "Scientific and Technical Journal Articles in Saudi Arabia," Trading Economics, http://www.tradingeconomics.com/saudi-arabia/scientific-and-technical-journal-articles-wb-data.html.

56 "Research and Development Expenditure (percent of GDP)," World Bank. World Bank figures for 2009 and 2010 were unavailable.

57 "Even Oil-rich Arab States Need Innovation, Says UNESCO Report," November 8, 2010.

58 *UNESCO Science Report 2010: The Current Status of Science Around the World* (Paris: UNESCO Publishing, 2010), p. 271.

Civilian industrial capacity has always been the weakest pillar of Arab economies. In Saudi Arabia and the UAE, industrialization is relatively recent, and it will likely take close to a decade before either country fully integrates its civilian and military industrial sectors and consequently moves up the ladder of defense production. But a fair assessment of Saudi and Emirati industrial activity must speak to the relatively short political history of both countries and account for the exponential progress they have made in recent years. Two decades ago, Saudi Arabia and the UAE were nearly at the bottom of the standard hierarchy of defense production, buying sophisticated military systems without being able to operate them. Currently, they are somewhere between tier two and tier three, able to use proficiently most of the arms they purchase, and produce, export, and adapt existing technology to market and security requirements.

Table 1. The Hierarchy Of Defense Production

Tier One	States that innovate at the technological frontier, and therefore temporarily become the sole or dominant producers of a given arms technology
Tier Two	States that produce at or near the technological frontier, and are capable of adapting existing technology to market and security requirements
Tier Three	States that copy and reproduce (apply) existing technologies but that do not capture the underlying process of innovation or adaptation
Tier Four	State that acquire and use existing technologies but are incapable of production
Tier Five	States that acquire technologies and cannot use them or that do not obtain them at all

Source: Adapted from K. Krause, *Arms and the State: Patterns of Military Production and Trade* (Cambridge: Cambridge University Press, 1992), pp. 31-2.

Saudi Arabia has been steadily developing and expanding its industrial capacity over the past four decades. The sector has obviously received considerable support from the government, and this has allowed for the building of infrastructure, the construction of industrial cities across the Kingdom including Jubail and Yanbu, and the establishment of a Saudi Industrial Development Fund (SIDF). The Saudi private sector has also been involved, cooperating with Riyadh's plans and responding to the country's industrial needs. Data from SIDF illustrate the growth of the sector since the 1970s: for example, the number of operating industrial units in Saudi Arabia has increased from 198 in 1974 to 5,043 in 2011. In addition, the capital that has been invested in the sector has reportedly increased from $3.2 billion in 1974 to about $135 billion in 2011. At the same time, the number of employees has increased from 34,000 in 1974 to 638,000 in 2011.[59]

But such improvements shouldn't mask the lingering weaknesses of overall industrial activity in the Kingdom. Industry in Saudi Arabia is dominated by the petroleum sector, the non-metallic minerals sector, the food & beverages sector, and chemicals sector. If military industrialization is to proceed at a faster pace, Riyadh has to further invest in industrial production of materials necessary to sustain the defense sector, such as basic metals, various machinery, electronics, and communications equipment. Progress on this end is also tied to the growth of local manpower and expertise.

Similar industrial manufacturing challenges exist in the UAE, despite the impressive progress the country has made over the past couple of decades in the sector. In short, there simply aren't enough factories and plants to manufacture the basic tools and ingredients of defense, or sufficient manpower and expertise to do it. Oil and gas remain the most important raw materials in the UAE industry, though this is likely to gradually change in the coming years knowing the country's aggressive push for economic diversification. The defense and aerospace sector in the UAE does however have a precious ally in the country's aluminum sector. The UAE has one of the largest aluminum smelters in the world and its produced aluminum is almost of the highest purity. The UAE exports its aluminum metal to more than 124 countries around the

59 "Industrial Development in Saudi Arabia," SIDF, http://www.sidf.gov.sa/En/INDUSTRYINSAUDIARABIA/Pages/IndustrialDevelopmentinSaudiArabia.aspx.

world (the UAE reportedly came in the thirty-fourth position globally in its aluminum exports in 2011, advancing by seven places from the previous year),[60] and it is considered the second most important export item after oil. This sophisticated industry has played an important role in the training of UAE nationals in technology.

Seeking to boost its industrial capacity, the UAE has built the Khalifa Industrial Zone of Abu Dhabi (KIZAD),[61] which aims to attract international industrial names to form partnerships with local ventures.[62] KIZAD is expected to significantly contribute to the UAE's 2030 plan and specifically deliver 15 percent of non-oil GDP.[63]

Information Base: The rationalization of national industrial activity requires effective dissemination of information. From purchasing raw materials or shipping them to assembling and marketing the end-products, a solid and secure information base is necessary.

It is a huge task, but luckily there is the Internet. A quick look at Internet statistics in the UAE and Saudi Arabia shows promise in this regard. The UAE has been leading all Arab countries in Internet use with a penetration rate of 75 percent (it rose from a modest 28.3 percent in 2002),[64] whereas in Saudi Arabia almost half of the population in 2012 used the Internet (it catapulted from a meager 6.4 percent in 2002).[65] Saudi Arabia and the UAE also have the highest rates of Smartphone penetration at 63 percent and 61 percent, respectively.[66]

Saudi Arabia has been quietly nurturing a new breed of entrepreneurs in the interest of creating a more knowledge-based economy. They are Saudi Arabia's young "tech geeks" and their role and growth will have vast implications for the future development of the Kingdom's information base and cyber security plans. One initiative worth highlighting is ArabNet's Jeddah TechNight, which was recently hosted by the Jeddah Chamber of Commerce and Industry (JCCI) in partnership with Qotuf and Badir Program for Technology Incubators. More than 150 young Saudi entrepreneurs and business leaders in the digital sector gathered to discuss the current entrepreneurship ecosystem in Saudi Arabia and learn from the success—and failure—of others.[67]

But as considerable as the Internet's information and communications benefits are, an unsecured Internet can also cause a great deal of harm to a country's economy, national security, military forces, and information base. Having been the target of several high-profile cyberattacks over the past couple of years (the Ministry of Finance, Interior, Foreign Affairs, and Labor as well as Saudi Aramco and Rasgas have been hit) the Kingdom is all too familiar with the threat.

Despite its deficiency in ICT manpower and local expertise, Saudi Arabia has sought to develop its cyber security capabilities in recent years with the collaboration of international companies. According to Saudi Brigadier General Naef Bin Ahmed Al Saud, the top international IT corporations have a significant presence in the Kingdom and have helped to set up highly sophisticated computer networks for the country's defense and economic infrastructure including electric power grids, water supplies, oilfield maintenance, and petroleum pipelines to shipping terminals.[68]

60 "UAE Aluminum Exports Grow 102% in H1 2012," *Gulf News*, December 29, 2012.

61 Kizad, http://kizad.com/en.

62 Dubai set the standard for creating an industrial heartland in 1985 when it established Jebel Ali Free Zone. Tom Arnold, "The Very Model of Industry," *National*, November 18, 2011.

63 Ahmad Lala, "Khalifa Industrial Zone Abu Dhabi (Kizad) Q&A," *Arabian Supply Chain*, October 2, 2013.

64 Maya Rahal, Quick Stats about Internet Usage in the Middle East, Wamda, March 27, 2013. See *UNESCO Science Report 2010*, p. 269 for past statistics of Internet penetration in the UAE.

65 Internet World Stats, October 2012. See *UNESCO Science Report 2010*, p. 269 for past statistics of Internet penetration in Saudi Arabia.

66 Internet World Stats, October 2012.

67 "Jeddah TechNight: Entrepreneurs Are Key to Creating Sustainable Knowledge-Based Economy in Saudi Arabia," ArabNet, November 4, 2013.

68 Naef Bin Ahmed Al-Saud, "A Saudi Outlook for Cybersecurity Strategies: Extrapolated from Western Experience," *JFQ*, issue 64, 1st quarter 2012, p. 79.

Saudi Arabia now has a National Information Security Strategy, a National Center for Electronic Security headed by Saleh Al Mutairi, and an operational computer emergency response team (CERT). In addition, the Kingdom has reportedly built a secure online operations center in partnership with IBM, and is likely to increase its focus on Smart City initiatives. It helps of course that Riyadh has deep pockets that allow it to make considerable investments in the field. According to official statistics, Saudi Arabia spent more than $6 billion last year alone on cyber security.[69] Given its critical importance in today's world, IT security software spending in Saudi Arabia is likely to increase in the future. According to Gulf security analyst Ted Karasik, "Saudi Arabia is forecast to invest $1.4 trillion in security and safety systems over the next 10 years."[70]

As the most technologically advanced country in the Arab world, the UAE is especially vulnerable to cyber threats. Like their Saudi counterparts, Emirati officials are seeking to enhance the security of their digital communications systems to confront any threat to national security. In addition to creating its own CERT in 2008 (with the help of foreign companies), the UAE introduced legislation in 2012 (Federal Decree No. 3 for 2012) to create a national authority for cyber security (the National Electronic Security Authority (NESA) with headquarters in Abu Dhabi).[71] But the country presumably still lacks a defense cyber doctrine.

As Saudi Arabia and the UAE continue to purchase sophisticated weapons that rely on advanced networks and communications systems, both countries will have to rely on their own domestic command, control, communications, computers, intelligence, surveillance and reconnaissance (C4ISR) capabilities to defend against cyber threats. That's because dependency on foreign companies to secure and manage these highly sensitive systems is inherently risky. One major risk, according to INEGMA security analyst Aleksandar Mitreski, is that "such advanced systems might have a hidden kill switch [that suppliers own] which can shut down the system (or parts of it) and can be activated remotely should there be a reason for it."[72]

With limited S&T foundations, Saudi Arabia and the UAE have struggled mightily over the years in creating both a scientific and technological infrastructure.

Science and Technology: Another central pillar of any military industrial activity is science and technology. A primary task for any given developing country with defense industrial aspirations is to ensure the acquisition of science, which often happens through technology transfers.

With limited S&T foundations, Saudi Arabia and the UAE have struggled mightily over the years in creating both a scientific and technological infrastructure. A major challenge in both countries is the higher educational system, which, according to a 2010 UNESCO report, "has performed relatively poorly when it comes to generating knowledge."[73] But it all starts with intent and strategy, and there are tangible signs of substantial improvement in both countries.

69 "About the Summit," Digital Security Summit, http://www.digitalsecuritysummit.com/about/summit/.

70 Ted Karasik, "Saudi Arabia's Defense Posture Is Robust," *Al Arabiya*, September 23, 2013.

71 Awad Mustafa, "UAE Leads the Way in Cyber Security," *National*, December 10, 2012.

72 Aleksandar Mitreski, "The Case for a UAE Cyber Defense Doctrine," INEGMA, October 7, 2013.

73 "Even Oil-rich Arab States Need Innovation, Says UNESCO Report," UNESCO, press release, November 8, 2010.

While Saudi expenditure on S&T is very low compared to other developing countries,[74] the Kingdom has emphasized the role of science and technology in government and society. Saleh Abdulrahman Al Athel, a professor of science and mechanical engineering at King Saud University, shows the relative progress the Kingdom has made in the field: "Over the past decade, the number of colleges in Saudi Arabia devoted to science and engineering has more than doubled from thirty-three to seventy-four. Likewise the number of students seeking degrees in science and technology has risen from some 39,000 to 76,000 (in 1975, the number was less than 6,000). Today, Saudi Arabia has some one hundred research institutes and centers—90 percent of which are associated with publicly funded universities or government agencies. With roughly 730 researchers per 1 million population, Saudi Arabia's percentage of researchers is twice that of the average of developing countries, a figure that is expected to increase as spending for scientific research rises in the future."[75]

In an effort to upgrade its national scientific and technological capacities, Saudi Arabia adopted a National Science and Technology Policy in 2003. Located on the Kingdom's western coast, the King Abdulaziz City for Science & Technology (KACST) is Saudi Arabia's national R&D organization. It has a vision of "[being] a world-class science and technology organization that fosters innovation and promotes knowledge-based society in the Kingdom."[76] KACST has state-of-the-art laboratories and research equipment and draws researchers and scientists from around the world. In December 2010, KACST and Boeing signed an agreement to establish a "Decision

International Atomic Energy Agency Director General Yukiya Amano visits King Abdulaziz City for Science & Technology in January 2013.

Image Credit: IAEA Imagebank, Flickr. Licensed under Creative Commons.

74 Saleh Abdulrahman Al-Athel, "Science in Saudi Arabia," TWAS Newsletter, vol. 18, no. 4, 2006, pp. 42-49.

75 Ibid.

76 King Abdulaziz City for Science & Technology, http://www.kacst.edu.sa/en/Pages/default.aspx.

A view from the library of King Abdullah University of Science and Technology.
Image Credit: Anders Lanzan, Flickr. Licensed under Creative Commons.

Support Center" in Riyadh City in late 2011 to conduct advanced modeling, simulation, and analysis activities with aerospace customers and partners in the Kingdom.[77] KACST and the Massachusetts Institute of Technology (MIT) also recently teamed up to create the Center for Complex Engineering Systems (CCES), whose mission is to improve understanding of these systems and to jointly conduct world-class research (the center is collocated between KACST and MIT). In February 2013, KACST entered into a partnership with Lockheed Martin to allow for the transfer of expertise in several specialized fields including the defense sector. The agreement between KACST and Lockheed Martin is designed to train qualified Saudi staff on research and technology knowledge.[78] Later in October, KACST and Lockheed Martin agreed to jointly allocate research investment funding for Saudi universities, over a three year period.[79]

The creation of more science parks and institutes is on Riyadh's agenda. Some of the more notable science parks in the country today include Riyadh Techno-Valley,[80] Dahran Techno-Valley,[81] and Prince Abdullah Bin Abdulaziz Science Park.[82] The largest and most specialized science university in Saudi Arabia is the King Abdullah University of Science and Technology,[83] which opened in September 2009 with a research agenda

77 MD Rasooldeen, "KACST, Boeing Sign Deal for DSC," *Arab News*, December 8, 2010.

78 Shuja Al Baqmi, "Saudi Arabia Boosts Defense Capabilities through Specialized US Company after Signing Direct Cooperation Agreements," *Al Sharq Al Awsat*, February 3, 2013.

79 Andy Sambidge, "US Defense Giant Launches Saudi Tech Partnership," ArabianBusiness.com, October 13, 2013.

80 Riyadh Techno Valley, http://www.rtv.com.sa/ar/Default.aspx.

81 King Fahd University of Petroleum & Minerals, http://tie.kfupm.edu.sa/.

82 Prince Abdullah Bin Abdulaziz Science Park, http://www.ccse.kfupm.edu.sa/~cadprj/.

83 King Abdullah University of Science and Technology, http://www.kaust.edu.sa/.

A scene from the campus of Masdar Institute of Science and Technology in Abu Dhabi.
Image Credit: Masdar Official, Flickr. Licensed under Creative Commons.

focused on four strategic areas: energy and the environment, biosciences and bioengineering, materials science and engineering, and applied mathematics and computational science.

Science and technology are also a priority for the UAE's leaders. In 2010, the UAE spent around $5 billion on technology investments. "The country's focus on information and communication technologies," said Sheikha Lubna Al Qasimi, the UAE Minister of Foreign Trade, "has transformed it into one of the Middle East's most technology-enabled states."[84] Sheikh Nayhan Bin Mubarak Al Nahyan, the UAE minister of higher education and scientific research, affirmed that his country is committed to being at the forefront in usage of modern technologies. "Abu Dhabi has become an important regional center for technology and innovation, particularly in the fields of sustainable technology, preserving the environment, diversifying sources of national income and in the dissemination of culture, science and quality of life improvements for the whole of the society," said Nahyan.[85]

Like Saudi Arabia, the UAE has created science universities, parks and institutes over the years. Zayed University, American University of Sharjah, United Arab Emirates University (UAEU), Abu Dhabi University (ADU), Al Hosn University, and the Abu Dhabi chapter of the Sorbonne University are some of the best-known national institutions that teach science. The Higher Colleges of Technology (HCT), on the other hand, offer a more technically oriented education in twelve well-equipped colleges spread throughout the country. In April 2013, UAEU agreed to partner with Mubadala Aerospace to provide training for Emirati technicians in aircraft composite production.[86]

84 Himendra Mohan Kumar, "UAE Spending $5b on Technology this Year," *Gulf News*, December 6, 2010.

85 Ibid

86 Abu Dhabi: Key Role for Defence in Diversification Efforts," Oxford Business Group, April 16, 2013.

In 2007, Abu Dhabi created a national fund for S&T called the Mohammed Bin Rashid Al Maktoum Foundation. The Foundation has an initial endowment of $10 billion and "will invest in knowledge creation and in translating knowledge into goods and services, as well as in human development."[87] The UAE also hosts the Masdar Institute of Science and Technology, which was developed in cooperation with MIT, the Al Reef Institute of Logistics and Applied Technology,[88] the Dubai Techno Park,[89] and Dubai Biotechnology & Research Park, or DuBiotech.[90]

Yet despite Saudi and Emirati advancements in S&T over the past decade, both countries have still been unable to create dynamic linkages between science institutions (universities, parks, institutes, etc.,) and the defense industry, an outcome which has undermined their ability to successfully pursue technology transfers. Finally, most R&D and S&T activities in Saudi Arabia and the UAE are allocated within the public and university sectors, with only small contributions from the private sector.

Defense Production Policy: Without a viable national defense production policy, the process of military industrialization can easily lose its sense of purpose and direction. The defense industrial aspirations of Saudi Arabia and the UAE are undoubtedly strong, but neither country seems to have an official defense production policy.[91]

To succeed at military industrialization, Saudi and Emirati leaders need to ask themselves: what is the real strategic and tactical purpose of producing arms? Riyadh and Abu Dhabi cannot just settle for the expected benefits that military industrialization offers. Precision is important, because it determines expectations, the choice of industrial strategy, the level of spending, and the type, number, and cost of weapons produced. Ratios of manpower-to-equipment, for example, should make sense. In other words, too much military hardware, whether produced locally or purchased from foreign sources, that cannot be rationally used and maintained is a burden on the military and the economy. Saudi Arabia and the UAE, along with other Middle Eastern countries, are acquiring more arms than they can usefully absorb, which has been a trend since the early 1990s.[92]

Achieving the right proportion is a task that even the most modern defense establishments in the world struggle with. In the West, comprehensive military studies and defense reviews are periodically produced to achieve optimum levels of efficiency and effectiveness in defense planning. Such efficiency and effectiveness in Saudi and Emirati strategic planning is currently elusive, but with Washington's advice and cooperation the process can certainly be facilitated. And the United States has every interest in playing this advisory role.

87 Mohammed bin Rashid Al Maktoum Foundation, www.mbrfoundation.ae.

88 Al Reef, http://www.alreef.ac.ae/default.asp.

89 TechnoPark, http://www.technopark.ae/.

90 DubioTech, http://www.dubiotech.ae/

91 "United Arab Emirates," Transparency International, July 2012.

92 Sayigh, *Arab Military Industry*, pp. 36-7.

Accomplishments

Only a decade ago, it would have been difficult and almost pretentious to speak of indigenous defense industries in Saudi Arabia or the UAE. The two countries' attempts at developing their national defense capabilities would typically be limited to the purchasing of the most modern arms from primarily Western sources, many of which they would have to rely on expatriates to utilize and wouldn't be able to maintain themselves. However, at present, both countries' military personnel have drastically enhanced their military training and can operate some of the most sophisticated weapons systems, while also successfully absorbing some technology transfers and engaging in arms design, production, and maintenance. Increased defense spending over the years and the development of strategic partnerships with Washington, London, and Paris and some of the most advanced transatlantic defense firms have offered Saudi Arabia and the UAE the opportunity to aggressively pursue defense industrialization.

Defense Spending: To protect their critical infrastructure, deter Iran, secure their oil and gas industries, and pursue a range of foreign policy initiatives in the Gulf and overseas, Saudi Arabia and the UAE have progressively increased their defense spending over the years.

Table 2. Military Expenditure In UAE and Saudi Arabia
(in constant US dollars for 2002-2011 and current US dollars for 2012)

Year	UAE	Saudi Arabia
2002	9,964	24,343
2003	10,455	24,522
2004	11,289	27,262
2005	10,506	32,849
2006	10,632	37,420
2007	11,412	43,105
2008	13,752	42,306
2009	15,913	43,477
2010	16,062	45,245
2011	[19,116]	46,219
2012	Unavailable	[54,218]

Source: IMF and SIPRI.[93]

At a time when defense budgets in developed states are under pressure from fiscal constraints, the share of GDP accounted by Saudi Arabia and the UAE's defense sector is continuing to climb. In the UAE's case, it has risen from 5.1 percent in 2008, to stand at 5.6 percent in 2012. It is also forecast to rise to 6.8 percent by the end of 2017.[94]

93 *SIPRI Yearbook 2012: Armaments, Disarmament and International Security* (Oxford: Oxford University Press, 2012), p. 213.

94 "United Arab Emirates Defense and Security Report Q4 2013," Business Monitor International, August 2013.

Saudi Arabia has continued to allocate at least 8 percent of its GDP to defense procurement since 2004. According to a 2014 IISS report, Saudi Arabia will spend $59.6 billion in 2014, which puts it ahead of the UK and France at fourth place globally, after the US, China, and Russia.[95] Valued at $52.9 billion in 2013, Riyadh's defense expenditure is placed seventh among the top ten military spenders, and is expected to increase at a compound annual growth rate (CAGR) of 7.92 percent, to reach $77.3 percent billion by 2018.[96]

Offset Programs: Offsets have played a prominent role in defense relations between Western and Middle Eastern countries.[97] In the Gulf, Saudi Arabia and the UAE have developed some of the most sophisticated offset policies, emphasizing technology transfer. Without these offset programs, Saudi and Emirati domestic defense industrialization plans would have arguably not seen the light of day.

According to a study by the American consulting firm Frost & Sullivan, the UAE and Saudi Arabia are projected to be among the top twenty global military offsets markets for the next decade.[98] Saudi Arabia is expected to have a CAGR of 3.9 percent between 2012 and 2021, and the cumulative value of its military offset obligations is expected to surpass $62 billion by 2021.[99] The UAE is projected to have a cumulative offset market estimated at a little more than $31 billion during 2012-2021, but with a CAGR of 4.3 percent.[100]

The Saudi Offset Program

Saudi Arabia's Economic Offset Program (EOP) officially started in the mid-1980s, although one can argue that its beginnings can be traced to two decades earlier when the British Aircraft Corporation supplied the Royal Saudi Air Force (RSAF) with six second-hand Lightning and six Hawker Hunter fighter planes, along with missile launchers under a program that became known as Magic Carpet. However, no formal offsets were associated with the $25 million Magic Carpet contract.[101]

Table 3. The Saudi Offset Program

Agency handling	Economic Offset Committee
Part of Procurement Decision	Yes
Offset Sector	Civilian and military
Minimum Value of Contract	Not specified
Minimum Offset Required	35%
Term	Within 10 years
Multipliers	Subject to approval of offset authority
Penalties	Best efforts but reconsidering policy
Focus	Jobs, training, technology transfer and investment
Direct vs. indirect	Mix with original focus on direct
Eligible Offset Activities	Investments in joint ventures with local parties

95 "Remarks by Dr John Chipman, Director-General and CEO, IISS," IISS press release, February 5, 2014, http://www.iiss.org/en/about%20us/press%20room/press%20releases/press%20releases/archive/2014-dd03/february-0abc/military-balance-2014-press-statement-52d7.

96 Mike King, "Saudi Arabian Defense Industry Placed Seventh among the Top 10 Military Spenders," CompaniesandMarkets.com, April 18, 2013, http://uk.finance.yahoo.com/news/saudi-arabian-defence-industry-placed-000000421.html.

97 There is no consensus among economists and defense specialists on what offsets typically mean. Broadly speaking, as a result of a defense deal, the foreign supplier has to invest in local industrial projects so that the recipient country can offset the cost of defense procurement. The percentage of the offset can be up to 100 percent of the contract value—and even more. Offsets can be direct or indirect. Direct offsets usually are in the form of coproduction, subcontracting, training, production, licensed production, technology transfer or financing activities. Indirect offsets, which can be defense-related and non-defense-related, include purchases, investment, training, financing activities, marketing/exporting assistance, and technology transfer. The most popular military offsets transaction categories are procurements (indirect), subcontracting (direct), and technology transfer and licensed production (direct).

98 Dominik Kimla, "Military Offsets and In-country Industrialization—Market Insight," Frost & Sullivan, March 2013.

99 Ibid.

100 Ibid.

101 "Crown Prince Sultan Ibn Abdulaziz Al Saud," *Telegraph*, October 23, 2011.

The Kingdom's EOP was the first among GCC countries and was followed by the UAE in 1991-92.[102] Saudi Arabia saw and continues to see its EOP as a means to reducing the economic burden created by an underlying defense import contract. It was designed to set up a number of private sector business projects and mutually beneficial partnerships between Saudi and foreign companies, usually in the form of joint ventures (JVs). The Saudi government is primarily looking for technology transfer to upgrade its own capabilities for an overall diversification and strengthening of the economy. Other objectives are to make the best use of the country's natural resources, improve potential for long-term export, and develop various service industries needed for supporting infrastructure. But it must be stressed that it is transfer of technology, "Saudization," and technological education that successive chairmen of the EOP including Saudi Minister of Economy and Planning Mohammad Al Jaser, the current EOP chairman, have emphasized over the years.

In 1983, Riyadh established the Saudi Economic Offset Committee (SEOC) to facilitate and monitor defense offsets in the Kingdom and execute the policies of the Ministerial Committee, which is chaired by the minister of defense and aviation. The SEOC comprises representatives from the Saudi Arabian Basic Industries Corporation (SABIC), the Saudi Industrial Development Fund (SIDF), and the Ministries of Commerce, Planning, Industry, and Defense. The Saudi Ministry of Defense provides SEOC with a sizeable but unspecified budget.

Saudi offset policy has mostly followed the indirect approach over the years (i.e., focusing on transfer of technology and training of local labor). It has evolved through a number of programs including Peace Shield I and II (1984-1985 and 1991), Al Yamamah I and II (1986 and 1988), General Dynamics Economic Balance Program (1992), McDonnel Douglas Peace Sun IX (1993), Al Sawari I and II (1994 and 1997), and AT&T Offset (1994).[103] The largest of these programs are the US Peace Shield, the British Al Yamamah, and the French Al Sawari. These three Saudi offsets represented the world's biggest attempt at planned international technology transfer and were considered the prototype for larger proposed offset programs in other Gulf countries.[104]

According to the General Secretariat of the Saudi EOP, as many as thirty-six industrial service projects were created by the end of 2006, with investments totaling about $4.5 billion. These projects created more than 6,500 new job opportunities, with at least 56 percent of them are filled by Saudis. An advanced aerospace industrial complex has been established with the foundation of Alsalam Aircraft Company, AEC,[105] Aircraft Accessories and Components Company,[106] the Middle East Propulsion Company,[107] and

102 Al-Ibrahim, Y. and Al-Wazar, M. "Offset Perspective in Kuwait," Offset Forum—Joint Investment for Development, Ministry of Finance, Kuwait, May 13-14, 1996.

103 Through the General Dynamics Economic Balance Program, General Dynamics Corp. supplied the Royal Saudi Land Forces with M1 A2 Abrams Main Battle Tanks and associated equipment and systems. Under the McDonnel Douglas Peace Sun IX deal, the Royal Saudi Air Force received F-15 fighter aircraft and associated equipment and systems from McDonnel Douglas Corp. Finally, the terms of the AT&T contract allowed the Saudi government, with the help of AT&T International, to expand the country's telecommunications infrastructure by installing an additional 1.5 million telephone lines and 200,000 GSM lines.

104 Chris Thompson, "Planned International Technology Transfer: The Economic Offset Example in Saudi Arabia," *Digest of Middle East Studies*, Winter 1994, p. 13.

105 Established in 1988 under the directives of the Government of Saudi Arabia, the Advanced Electronics Company is an offset program company and now a recognized leader in the field of modern electronics manufacturing, system integration and repair and maintenance services. Its mission, according to the official website of the company, is "to continuously improve and diversify our offerings by aligning our business strategies with end customers' priorities, creating long-term partnerships, harnessing opportunities, acquiring new capabilities, creating job opportunities and investing in our people and community at large. To demonstrate unrivalled leadership across all aspects of our business and act in the most professional and ethical manner." Advanced Electronics Company, http://www.aecl.com/home.aspx.

106 Aircraft Accessories & Components Company Ltd., http://www.aacc.com.sa/.

107 Middle East Propulsion Company (MEPC), http://www.mepcsa.com/home.aspx?lang=en-us.

International Systems Engineering Company.[108] These companies provide comprehensive maintenance, repair, and overhaul services for the Saudi Armed Forces and Saudi Airlines.[109]

Looking at Saudi offset programs over the past three decades, Dr. Mohamed A. Ramady, of the Department of Finance and Economics at King Fahd University of Petroleum and Minerals, evaluates overall output and reveals a fairly modest picture.[110] Out of all twenty-two projects implemented and under construction, only one generated advanced technical training and high value employment for Saudis, while three projects enabled the transfer of technological know-how through R&D and manufacturing processes.[111] More promisingly, however, four projects boosted import substitution and export while six contributed to the development of technological know-how through R&D and manufacturing processes.[112] With regard to the level of technology transfer through these twenty-two offset projects, the result is relatively positive, according to Ramady. Roughly 86 percent of the total fell in the categories of higher-packaged transfer (i.e., more comprehensive technology transfers) and only 14 percent were in the category of low-packaged transfer. In terms of industry, the advanced electronic sector, as well as specialized technical training stood out as being in the higher-packaged categories of technology transfer.

The Saudi EOP has also contributed $8.5 million to support the General Organization for Technical Education and Vocational Training in developing the Saudi National Occupational Skills Standards Program. The Program resulted in setting up the technical standards for 250 different professions together with their associated training materials.[113] Finally, the Saudi EOP played an important role in establishing Alfaisal University. The University offers undergraduate and graduate programs in medicine, science, and engineering.[114]

The UAE Offset Program

The UAE Offset Program was initiated in 1992, a year after the First Gulf War, by Sheikh Mohamed Bin Zayed Al Nahyan for the purpose of deriving economic and commercial value from the country's extensive defense procurement program.

Table 4. The UAE Offset Program

Agency handling	UAE Offsets Group (UOG)
Part of Procurement Decision	Yes
Offset Sector	Military
Minimum Value of Contract	$10 million
Minimum Offset Required	60%
Term	7 years
Multipliers	Yes but unpublished
Penalties	8.5% of offset obligation or 4.5% of total contract
Focus	Sustainable wealth creation
Direct vs. indirect	No distinction
Eligible offset activities	Profits of joint ventures with local parties

During its initial phase, the UAE offset program was managed by the UAE Offsets Group, a government-sponsored entity conceived as an economic promotion association but was considered more of a venture capital. In 1992 a major series of revisions were made to the guidelines, with further changes made again in 1994 to amend the 1992 changes. To date, the Offset Program has resulted in the creation of several multi-million dollar JVs in various economic and industrial sectors.

108 International Systems Engineering, http://www.ise.sa/en/default.html.

109 "Major Achievements," Saudi Economic Offset Program.

110 M.A. Ramady, "Components of Technological Transfer: A Comparative Analysis of Offset and Non-offset Companies in Saudi Arabia," *World Review of Science, Technology, and Sustainable Development*, vol. 1, no. 3, 2004.

111 Ibid.

112 Ibid, "Saudi Defense-related Companies Established by Way of Technology Transfer and Joint Ventures," table 6.

113 Ibid.

114 Ibid.

Responsible for all aspects of managing the UAE Offset Program is the Offset Program Bureau (OPB). In 2007, OPB created a fully owned subsidiary and strategic investment arm called Tawazun Holding.[115] Tawazun's objectives are guided by the Abu Dhabi government's Policy Agenda, which focuses on diversifying the economy, transferring technology, building an industrial base, and developing the skills of UAE nationals. Three years later, OPB announced new guidelines that allowed it to "move from a model based purely on the profit generated by ventures backed by offset program-obligated parties to one where technology and the production of goods will be central to the program, thus providing more flexibility to [the global defense contractors]."[116] This has forced many defense companies that have an interest in doing business in the UAE to flesh out a more focused and coherent offset strategy that would address the new reforms.

Up to 2011, OPB had successfully launched over forty-eight new UAE business ventures investing an amount of over $1.6 billion, according to OPB Director of Offset Unit Matar Ali Al Romaithi.[117] In 2012, OPB officially acquired a new name: Tawazun Economic Council. Tawazun in Arabic means balance, and the name was used to illustrate the Council's mandate of balancing between sustainable economic and social development. Tawazun Economic Council and Tawazun Holding, both led by CEO Saif Mohamed Al Hajeri, focus on helping to build a specialized manufacturing and engineering industry backbone in the UAE. Tawazun's areas of focus are aerospace systems, munition and weapon system, land systems, naval systems, autonomous systems, metals and advanced materials, radars, communication, command and control, and electronics.[118] An economic committee called Tawazun Economic Committee was later created by Abu Dhabi and tasked with building more effective and dynamic linkages between the UAE Armed Forces and Tawazun Economic Council.[119]

Technology Transfer: Offset programs have been crucial for Saudi Arabia and the UAE's defense plans because they have allowed them to acquire, identify, and in some cases, modify and absorb the latest technologies in the world of aerospace and defense, thus spurring domestic military industrialization in both countries. But the process of Saudi and Emirati absorption has not been easy or without problems. After all, effective employment of technology requires a highly skilled and educated labor force,[120] which, as previously discussed, is currently lacking in both countries.

Such challenges notwithstanding, Saudi Arabia and the UAE have also made headway in the area of technology transfer since the 1970s. In the past, technology absorption in Saudi Arabia and the UAE (and the rest of the Middle East) was limited to the capability to operate and maintain technologies and equipment imported from abroad. Riyadh and Abu Dhabi did not have the capability to design or significantly adapt these technologies themselves. This has changed drastically, as adaptation and modification of technologies has effectively taken place in both countries over the past decade.

According to a 1984 report by the US Congress' Office of Technology Assessment, Saudi technological absorption had been comparatively extensive in the sector of commercial aircraft support systems, where some capabilities such

115 Tawazun, http://tec.tawazun.ae/.

116 "History and changes in the UAE Offset Program," Blenheim Capital Partners, September 6-7, 2011; Anderson, "Offset in the UAE," for an assessment of OPB's reforms.

117 "Interview with Mr. Matar Ali Al Romaithi, Director of Offset Unit at Offset Program Bureau (OPB) of UAE," EPICOS, February 10, 2011.

118 Ibid.

119 "Tawazun Economic Committee," Tawazun, http://tec.tawazun.ae/tawazun-economic-committee.aspx.

120 Richard R. Nelson and Edmund Phelps, "Investments in Humans, Technological Diffusion, and Economic Growth," *American Economic Review*, May 1966, pp. 69-75.

Visitors view guns on display at an exhibition stand for Tawazun Advanced Defense Systems during the first day of the Abu Dhabi International Hunting and Equestrian exhibition in Abu Dhabi, September 5, 2012.

Image Credit: REUTERS/Ben Job.

as runways, fuel storage facilities, and radars can have defense applications.[121] Indeed, over one-half of the pilots of Saudia, the Saudi Arabian Airlines, were nationals at the time. Saudi nationals also held key managerial positions in these airlines. One would imagine that three decades later, the numbers would be even more promising (current data is not publicly available). But the problem continues to be that many non-nationals are performing maintenance and serving functions. Therefore, despite comparatively high levels of technology absorption, some aircraft operations will probably not become fully staffed by Saudis for many years.[122] In the telecommunications sector, technology transfers have been largely successful as well. And unlike the case with aircraft systems, Saudis produce telecommunications equipment, including cables, crossbar switches, and televisions.[123]

Through their large offset programs, Saudi Arabia and the UAE have been able to connect their local defense sectors with global defense producers and enable them to acquire basic industrial knowledge and know-how. The results are mixed, but in some areas encouraging, as a number of industries have been established in Riyadh, Abu Dhabi, and other locations in JVs with global industry giants.[124]

Saudi Defense Firms: Over the years, the Saudi Economic Offset Program has produced a number of local Saudi manufacturing agreements which have become successful private businesses. With roughly $100 billion in new arms procurement deals signed in the past few years by the Saudi government, high-value contracts (including the largest foreign arms deal in US history in 2010 and formalized in 2012 which amounts to a $60 billion order for new and upgraded aircraft weapon

121 *Technology Transfer to the Middle East* (Washington, DC: US Congress, Office of Technology Assessment, OTA-1 SC-173, September 1984), p. 405.

122 Ibid., p. 405.

123 Ibid., p. 405.

124 Haseeb Haider, "Abu Dhabi's Ambitious Military Industrial Complex in the Spotlight," *Khaleej Times*, February 14, 2013.

systems)[125] will not only provide Saudi Arabia with new EOP opportunities, but will also likely mean ongoing contracts for previously established EOP companies such as AAC and MEPC. This could very well usher in a new era for EOP cooperation for Saudi Arabia and its trading partners and provide further impetus for a self-sustaining defense and technology sector.[126] The table below lists some of the major defense-related companies that Saudi Arabia has been able to establish over the past two decades by way of technology transfer and joint ventures.

Table 5. Saudi Defense-Related Companies Established By Way Of Technology Transfer And Joint Ventures

Company	Specialization
Abdallah Al Faris Company for Heavy Industries	Manufacturing of armored vehicles
Advanced Electronics Company[127]	Modern electronics manufacturing, system integration and repair and maintenance services
Alsalam Aircraft Company[128]	Aircraft maintenance, modification, and technical support
Aircraft Accessories and Components[129]	Aircraft component overhaul on a wide range of mechanical, hydraulic, pneumatic, electrical, and fuel system components
Armored Vehicles & Heavy Equipment Factory[130]	Manufacturing, modernization and armoring of military vehicles
International Systems Engineering[131]	Systems engineering and development, information technology, and information-based services
Middle East Propulsion Company[132]	Propulsion systems and MRO services

Since the 1980s, Saudi Arabia has made some notable advances in the sectors of aircraft MRO and AIFVs and unmanned systems production and modification (specifically drones).

Aircraft: The history of aircraft MRO and modification in Saudi Arabia starts with Alsalam Aircraft Company. Established in 1988 as part of the Saudi EOP and through a JV between Boeing, Saudi Arabian Airlines, Saudi Advanced Industries Corporation, Gulf Investment Corporation, and

125 Under the terms of the deal, the RSAF will purchase eighty-four new F-15 fighters from Boeing and upgrade another seventy F-15s already in service. Other components of the deal include the purchase of more than one hundred helicopters for the Saudi Arabian National Guard, Army and Royal Guard. These include seventy AH-64D Apache Longbow attack helicopters built by Boeing, seventy-two Sikorsky UH-60M Black Hawk utility helicopters (Sikorsky Aircraft), thirty-six AH-6 Little Bird armed reconnaissance helicopters also made by Boeing and twelve MD-530Fs.

126 In February 2010, the Saudi Ministry of Defense allowed for the first time local firms to bid to supply basic materials excluding arms with the long-term goal of encouraging a domestic military industry. Saudi authorities expect the move to encourage foreign suppliers to partner with Saudi peers and set up shop within the Kingdom. In the past, all purchases were internationally tendered or bought from abroad by local suppliers. Abdul Rahman Al Zamil, a member of the Central Committee for Local Industrialization, hoped that "the defense ministry will gradually eliminate from international tenders all items that can be produced [inside the Kingdom]." "The efforts being made by different government departments including the armed forces as well as the private sector, companies involved in the Economic Offset Program and research centers reflect the desire to achieve self-sufficiency and reduce expenditure," former Deputy Defense Minister Prince Khaled Bin Sultan said on December 11, 2012, at the Dharhan International Exhibition Center. The inauguration of the Saudi Armed Forces Exhibition in February 2010 for materials and spare parts is a major step for Saudi Arabia to bolster its efforts in local defense manufacturing.

127 Advanced Electronics Company, http://www.aecl.com/.

128 Alsalam Aircraft Co., http://www.alsalam.aero/.

129 Aircraft Accessories & Components Company, http://www.aacc.com.sa/.

130 Armored Vehicles & Heavy Equipment Factory, http://www.avf.com.sa/index-en.html.

131 International Systems Engineering, http://www.ise.sa/en/default.html.

132 Middle East Propulsion Company, http://www.mepcsa.com/home.aspx.

National Investment Corporation, Alsalam has made important strides in the aviation market in the Middle East. The company has grown over the years to employ 3,500 people (55 percent of which are Saudi nationals) in its aircraft MRO business. While its primary business is derived from servicing military aircraft,[133] the company has branched out into more civilian operations and has signed maintenance contracts with Saudi Aramco for its C-130 transport planes as well as with Syrian Air and Air Atlanta Icelandic for Boeing 747 airliners. Alsalam has also done well in recent years with military contracts, inking a $145.2 million, five-year deal in August 2011 with the RSAF for work on its C-130 transport fleet as well as a $378.4 million contract for the maintenance of RSAF F-15 fighters. Alsalam has facilities at the industrial area of King Khalid International Airport in Riyadh that include three climate-controlled wide-body hangars that are equipped with the latest technologies in the field.

The Saudi Arabian aerospace defense sector is now fully engaged in upgrading the RSAF's fighter and unmanned capabilities. Mohammed Nour Falatah, CEO of Alsalam, said that the company had started manufacturing seventy wing sets to be fitted to the RSAF's Boeing F-15S (Saudi) Eagle fighters and performing other work as the company looks to upgrade these aircraft to F-15SA (Saudi Advanced) standard.[134] The RSAF will procure another eighty-four new-build F-15SAs direct from the US government.

AIFVs: Saudi Arabia's first indigenously manufactured AIFV is the eight-wheeled Al Fahd. Al Fahd is developed by the Abdallah Al Faris Company for Heavy Industries, which is based in Damman,near the coast of the Gulf. There are two variants of Al Fahd—the AF-40-8-1 Armored Personnel Carrier (APC) and the AF-40-8-2 Armored Fighting and Reconnaissance Vehicle

Alsalam Aircraft executives sign an agreement with Marshall Aerospace for a project with the Royal Saudi Air Force.

Image Credit: Alsalam Aircraft

(AFRV)—and both entered production in 1998. An unspecified number of vehicles have been delivered to the Saudi Arabian National Guard, which is part of the Armed Forces and serves both as a defense force against external threats and a security force against internal threats. The Abdallah Al Faris Company also manufactures the Al-Faris 8-400 armored personnel carrier (APC), used by Saudi land forces. In April 1997, the Saudi government made a decision to stop production of the Al-Faris 8-400 family of 6x6 armored vehicles.

Armored Vehicles & Heavy Equipment Factory, a subsidiary of Military Industries Corporation (MIC), is a state-owned corporation whose mission is to develop the Kingdom's military factories through technology transfer. It produces the 4x4 light armored vehicles Al Shibl 1 and 2, which are allegedly used by the Royal Saudi Land Forces and the Kingdom's elite special operations units of Battalion 85[135] (Al Shibl 1 and 2 were shown for the first time at IDEX 2010).

133 It performs specialized military aircraft services including Aircraft Support of its Typhoon fleet from the Royal Air Force (RAF) and the overhaul and repair of its Hawk squadron, also from the RAF.

134 Only sixty-eight F-15S fighters are now thought to remain in service following two attrition losses since the contract was signed.

135 King, "Saudi Arabian Defense Industry Placed Seventh among the Top 10 Military Spenders."

But while the Saudis claim they were able to domestically create Al Fahd, it is not clear how many components they had to import to manufacture this military vehicle. It is likely that the Saudi military imported the engines, the transmission, the suspension, and the heavy weapons, but welded steel locally. Also unclear is the total number of Al Fahd vehicles the Saudis produced. Some defense insiders suspect that the number did not exceed one hundred. Furthermore, the Saudi military relies not on local products but on foreign imports when it comes to AIFVs. For instance, the Canadian government has just signed a fourteen-year, multibillion dollar contract to supply the Saudi military with light armored vehicles.[136] Of course, it is not fair to compare Al Fahd with top-of-the-line tanks such as the US M1A1 (and "Saudi" M1A2S) Abrams or the German Leopard 2, but it is clear that Saudi tank production is very much behind in the technological curve and arguably cannot be relied on for real combat purposes.

Drones: Drone technology can help meet some of Saudi Arabia's national security needs. With the help of UAVs, Saudi Arabia could boost its surveillance of the mountainous frontier with Yemen to counter infiltration, particularly by al-Qaeda in the Arabian Peninsula (AQAP), a terrorist group which seeks, among other things, to topple the Saudi monarchy. Established in 2008 by the Saudi Air Force and King Fahd University in Riyadh, the Prince Sultan Advanced Technologies Research Institute "is reportedly working on a UAV surveillance project for eventual deployment on Saudi Arabia's borders."[137]

In September 2013, *Al Hayat*, a pan-Arab newspaper, reported that KACST built an unmanned aircraft that can fly ninety-three miles without a pilot. The aircraft allegedly can fly for eight hours at seventy-five miles per hour at an altitude of 16,400 feet and is seen as KASCT's latest step in its development of remotely-piloted aircraft.[138] A month later, KASCT's National Center for Aviation Technology disclosed that it produced thirty-eight unmanned aircraft systems (UAS) called Saker 2, Saker 3, and Saker 4 for research purposes. Light, made of fiberglass and carbon fibers, and programmed through a ground control room, they reportedly cannot be detected by radar and reconnaissance equipment.[139] It is suspected, however, that Denel Dynamics, the South African company that manufactures missiles and UAVs, might have helped Saudi Arabia develop its national drone program through technology transfer.[140]

Suspected technical and engineering collaboration between Saudi Arabia's Defense Ministry and Denel has been in the works for some time, and it is partly triggered by Washington's refusal to supply Riyadh with such unmanned systems. Riyadh has failed to convince Washington to sell its Predator MQ-1 craft, which are used by the US Air Force and the CIA and carry Lockheed Martin's AGM-114 Hellfire missiles. But Washington is reported to have supplied Predators specifically engineered to make it extremely difficult to mount weapons. Although it is not clear whether or how much collaboration exists between the Saudis and Denel, one thing for sure is that there would be physical limitation on the part of the Saudis. Depending on which drone Saudi Arabia is interested in codeveloping (presumably those suited for assassination missions of AQAP terrorist operatives), Riyadh does not have a military satellite communications system to employ any killer UAV.[141]

136 "Canada to Build Vehicles for Saudi Arabia," UPI, February 19, 2014.

137 "Saudis 'turn to South Africa for UAVs,'" UPI, April 16, 2013.

138 Shane McGinley, "Saudi Arabia Builds Unmanned Aircraft," Arabianbusiness.com, September 26, 2013.

139 Nawaf Afit, "KACST Produces 38 Drones," *Saudi Gazette*, October 12, 2013.

140 Hopewell Radebe, "Denel Helping Saudi Arabia Develop Drones," *Business Day*, April 12, 2013.

141 Only Israel has one in the region but Iran is developing its own satellite capabilities.

Emirati Defense Firms: From ammunition, strategic radars, and advanced communications equipment to desert armored vehicles, drones, guided rocket launchers and naval warships, Emirati defense companies are actively involved in the production and coproduction of some of the defense instruments that the UAE hopes to rely on to preserve national security. The growing list of UAE companies engaged in military industrial activity is driven by initiatives from Abu Dhabi-backed strategic investment arms such as Mubadala Development,[142] Tawazun Holding, International Golden Group,[143] and Emirates Advanced Investment.[144]

Abu Dhabi created Mubadala (which means "exchange" in Arabic) in 2002, and tasked it with the strategic goal of diversifying and transforming its economy. Operating with a broader scope than Tawazun, Mubadala invests across multiple national sectors—aerospace, communications, technology and defense services; financial investment; health care; industry; real estate and infrastructure; advanced technology; renewable energy; and oil and gas exploration—in an effort to generate sustainable profits to Abu Dhabi and the UAE. According to its official website, its portfolio is valued at more than $55 billion and it operates in more than seventeen countries globally.[145] Led by CEO Khaldoon Khalifa Al Mubarak, Mubadala aims to create 11,000 jobs for Emirati scientists, engineers, and technicians and has committed to an annual R&D development budget of $10 million in 2015, in partnership with original equipment manufacturers (OEMs) and academic institutions.[146] According to one senior US defense industry representative whose company has worked closely with both Mubadala and Tawazun, "Tawazun…works more closely with the UAE armed forces but Mubadala's profits are higher and the latter has a more effective business model and more diverse portfolio."[147]

Mubadala recently teamed up with Abu Dhabi Airports Company to work on building an aerospace cluster at Zayed Military City, where Tawazun is developing its Tawazun Industrial Park. This massive project is expected to create 10,000 direct and indirect jobs over the next decade. Led by CEO Rashed Helal Al Darmaki, the Park, which will focus on the arms industry, was set up to create a "knowledge hub" for defense and precision manufacturing in Abu Dhabi.[148] During the 2013 Dubai Air Show, Boeing announced that it entered into a partnership with Tawazun Precision Industries to establish a production aerospace surface treatment facility in Tawazun's Industrial Park. Made possible by the Tawazun Economic Council, this huge project is scheduled to be commissioned in 2016. Also during last year's Dubai Air Show, Mubadala secured deals worth $11.8 million through its aerospace, communications, technology and defense (ACTDS) sector. Agreements with Airbus, Boeing, GE, Rolls-Royce, and the UAE Armed Forces highlighted the company's goal to become a major global aerospace supplier.[149] ACTDS aims to be among the world's top three manufacturers of composite and metal parts for airplanes by 2020.

142 Mubadala, http://www.mubadala.com/.

143 International Golden Group, http://www.iggroup.ae/.

144 Official website of EAI, http://www.eai.ae/eai/.

145 "Overview," Mubadala, http://www.mubadala.com/en/who-we-are/overview.

146 Peter Shaw-Smith, "Mubadala Adds New Combined Portfolio at Dubai Airshow," AINOnline.com, November 17, 2013.

147 Author's interview with a US defense industry executive, Washington DC, March 19, 2014.

148 Ivan Gale, "Defence Industry Gears up in Tawazun," *National*, February 18, 2011.

149 Neil Churchill, "Mubadala Secures Dhs43bn At Dubai Airshow," *Gulf Business*, November 20, 2013.

Table 6. UAE Defense-Related Companies Established By Way Of Technology Transfer And Joint Ventures

Company	Specialization
Abu Dhabi Autonomous Systems Investment, a subsidiary of Tawazun[150]	Manufacturing of industrial capabilities in autonomous systems
Abu Dhabi Ship Building[151]	Naval repair, refits, and building
Abu Dhabi Systems Integration,[152] **a subsidiary of Abu Dhabi Ship Building and SELEX ES**	Naval combat systems and electronic systems design, development, integration, and maintenance
Adcom Systems[153]	Manufacturing of Unmanned Aerial Vehicles, aerial targets, air traffic control radar systems, and advanced communication systems
Al Jaber Group[154]	Construction and development of infrastructure, buildings, and industrial sites
Advanced Military Maintenance, Repair and Overhaul Centre, a JV owned by Mubadala, Sikorsky Aerospace Services, and Lockheed Martin[155]	Aircraft maintenance and support services to the UAE Armed Forces and other military operators throughout the South Asia, Middle East and North Africa regions
Advanced Technology Investment Company, a wholly-owned subsidiary of Mubadala[156]	Semiconductor industry
Al Taif Technical Services, a subsidiary of Mubadala[157]	Integrated life cycle support of defense systems through maintenance, repair, and overhaul (MRO) of equipment and components
Al Yah Satellites Communications Company, a subsidiary of Mubadala[158]	Satellite systems
Bayanat,[159] **a subsidiary of Mubadala**	Surveying, mapping, and geospatial information services
Burkan Munitions Systems,[160] **a JV between Tawazun Holding and Al Jaber**	Manufacturing, assembling, and testing of a wide range of ammunition such as infantry, artillery, and aircraft bombs
Caracal International,[161] **a subsidiary of Tawazun Holding**	Manufacturing of firearms, sniper rifles, and other light weapons
Global Aerospace Logistics[162]	Wide range of aerospace MRO and professional services
Gulf Logistics and Naval Support,[163] **a JV between Abu Dhabi Ship Building and BVT Surface Fleet**	Wide range of support services for maritime defense forces across the full spectrum of integrated logistics support and training

150 ADASI, http://www.adasi.ae/home.aspx.

151 ADSB, http://www.adsb.ae/Pages/Home.aspx#.

152 ADSI, http://www.adsi.ae/.

153 ADCOM Systems, http://www.adcom-systems.com/ENG/Home.html.

154 Al Jaber, http://www.aljaber.com/en/index.aspx.

155 AMMROC, http://www.ammroc.ae/.

156 Advanced Technology Investment Company, http://www.mubadala.com/en/who-we-are/businessunit/advanced-technology-investment-company.

157 Al Taif, http://www.altaif.ae/about.asp.

158 Al Yah Satellite, http://www.yahsat.ae/SitePages/AboutUs.aspx.

159 Bayanat, www.bayanat.co.ae.

160 Burkan, http://www.burkan.ae/.

161 Caracal, http://www.caracal.ae/new/.

162 GAL, http://www.gal.ae/.

163 "Gulf Logistics and Naval Support Is a Joint Venture between Abu Dhabi Ship Building and BVT Surface Fleet," *Al Defaiya*, July 27, 2009, http://tinyurl.com/k6rzmm9.

Table 6. UAE Defense-Related Companies Established By Way Of Technology Transfer And Joint Ventures (continued)

Company	Specialization
Horizon Flight Academy,[164] a subsidiary of Mubadala	Flight training, both fixed wing and helicopter pilot courses
Mahindra Emirates Vehicle Armouring[165]	Engineering, prototyping, and manufacturing of armored cars and other armored vehicles
Nibras Al Ain Aerospace Park, jointly created by Mubadala Aerospace and Abu Dhabi Airport Company Mubadala[166]	Establishment of a sustainable aerospace industry in the UAE
NIMR Automotive,[167] a subsidiary of Tawazun	Manufacturing defense vehicles
Strata,[168] a subsidiary of Mubadala	Manufacturing base for the UAE (and potentially global) aerospace industry
Tawazun Advanced Defence Systems, a subsidiary of Tawazun Holding, merged with Caracal	Manufacturing of firearms, sniper rifles, and other light weapons
Tawazun Dynamics,[169] a JV between Tawazun Holding and Denel Dynamics	Design, manufacturing, supply, and maintenance services for the precision-guided munitions (PGM) industry
Tawazun Precision Industries,[170] a subsidiary of Tawazun Holding	Industrial services including engineering, production, surface and heat treatment, machining, coating, repairing, and tooling
Tawazun Safety, Security & Disaster Management City,[171] a subsidiary of Tawazun Holding	Technical, vocational, and professional training for operations in the fields of safety, security, emergency preparedness, and crisis/disaster management

The UAE is investing in and focusing on AIFVs, ammunition, and unmanned systems (specifically drones). These three industries are currently Abu Dhabi's defense niche areas and targets of future local development. But Abu Dhabi is also exploring more complex and larger defense areas such as shipbuilding and rockets.

AIFVs: AIFVs are considered the primary means of survival for the UAE Army.[172] Abu Dhabi has been steadily modernizing its armed forces with large purchases of AIFVs over the years (the UAE reportedly has a fleet of over 2,000 AIFVs).[173] It is no surprise, then, that these combat vehicles have been prominent fixtures at IDEX in recent years.

With extensive funding from Mubadala and Al Jaber, local UAE companies are manufacturing 4x4 and 6x6 AIFVs with the help of Western technology. Manufacturers based in Abu Dhabi, Dubai, and Fujairah are also steadily developing their businesses to export trucks and armored vehicles to neighboring countries such as Algeria, Libya, and Jordan. In September 2012, International Golden Group, which works closely with the UAE government, entered into a JV with BAE Systems to manufacture RG31s, which are 4×4 armored mine-protected personnel carrier vehicles.[174] The extensive usage of these types of vehicles in Iraq and Afghanistan has attracted interest for them in the UAE for the mine and IED protection besides fast mobility features. Also

164 Horizon, http://www.horizonuae.ae/.

165 Mahindra, http://www.mahindraarmored.com/.

166 "Nibras Al Ain Aerospace Park: Catalyzing Abu Dhabi's Aerospace Industry," Mubadala, https://www.mubadala.com/en/what-we-do/aerospace/nibras-al-ain-aerospace-park.

167 NIMR, http://www.nimr.ae/.

168 Strata, http://www.strata.ae/web/en/.

169 Tawazun Dynamics, http://www.tawazundynamics.ae/.

170 Tawazun Precision Industries, http://www.tpiuae.ae/?cmd=app__intro.

171 Tawazun Safety, Security & Disaster Management City (also known as Jahezia in Arabic), http://www.jaheziya.ae/.

172 "IDEX 2013—UAE Fighting Vehicles," *Military Technology*, February 17, 2013.

173 Ibid.

174 The UAE operates seventy-five RG31s, which it has procured over the past seven years.

The UAE-developed Nimr armored patrol vehicle.

Image Credit: Nimr.ae

in 2012, Al Jaber Group partnered with Oshkosh Defense to deliver and support the Oshkosh Global HET vehicle.

Al Jaber and FNSS of Turkey joined forces in 2011 to capture the potential requirements of the UAE Armed Forces, covering the full-scale production of a wheeled armored vehicle family (WAV) in the UAE as well as its complete logistical support. During the 2012 International Exhibition for Security and National Resilience (ISNR) in Dubai,[175] International Golden Group showcased state-of-the-art technologies and equipment for manned and unmanned vehicle platforms, remote and crew-served turreted weapons systems, counterterrorism and emergency response, special task force weapons systems, critical infrastructure surveillance, detection and protection, and general security services.

Based in Ras Al Khaimah, Mahindra Emirates Vehicle Armouring manufactures custom AV for a variety of applications and is experienced in the fields of engineering, prototyping and manufacturing of armored cars and other armored vehicles. The Abu Dhabi-based NIMR Automotive supplies the UAE Armed Forces with armored vehicles. Such vehicles are the first piece of military hardware built entirely in the UAE. The UAE government and state-owned media were heavily promoting NIMR during IDEX 2013, and even purchasing in February 1,800 vehicles for $1.09 billion.[176] Foreign countries seem to be also interested in NIMR, which shows the export potential of the firm. In 2012 and 2013, Tawazun signed agreements with the Algerian and Turkish governments to set up JVs for NIMR.[177]

Ammunition: The UAE seeks self-sufficiency in the area of ammunition, and it seems to be moving ahead quickly with its stated goal. A few months after it was created in 2007, Tawazun acquired international arms manufacturer Adcom Manufacturing and renamed it Caracal Light Ammunition. It then took over its German subsidiary Merkel, one of the best-known hunting rifle and shotgun manufacturers in the world.

175 International Exhibition for Security & National Resilience, http://www.isnrabudhabi.com/Portal/home.aspx.

176 Michael Peel and Camilla Hall, "Abu Dhabi Pushes for Homegrown Defence," *Financial Times*, February 25, 2013; Awad Mustafa, "With Adcom Drone, UAE Makes Big Export Push," *Defense News*, November 18, 2013.

177 Mustafa, "With Adcom Drone, UAE Makes Big Export Push."

In 2010, Caracal made its first shipment of 5,000 9mm handguns to Knoxville, Tennessee, in the United States. And in an effort to further expand in the United States, the company signed in February 2013 a supply agreement with Century Arms, North America's largest importer of surplus firearms, ammunition, and accessories. It has also been reported that Caracal currently supplies pistols to an unnamed Italian police force. At IDEX 2013, Caracal launched Caracal Pyrotechnics to cater to the so-called nonlethal ammunition demands of law enforcement and national security services across the UAE. Caracal Pyrotechnics will manufacture signal cartridges, screening smoke, stun grenades, and colored smoke, among other nonlethal munitions.

Launched in November 2007, Burkan Munitions Systems is another Tawazun company that specializes in medium and heavy ammunition manufacturing.[178] Its Abu Dhabi-based factory, the first of its kind in the country and the GCC region, will not just produce ammunitions for the UAE's armed forces but will also employ and train UAE nationals on R&D. Like Caracal, Burkan is a joint project between Tawazun and Al Jaber Trading Establishment and Rheinmetall Munitions Systems. Built in August 2010, Burkan's multi-million dollar factory started producing a year later different sizes of small ammunition, including 9mm, 5.56mm, and 7.62mm. It also tests aircraft bombs, rockets, tank artillery, mortars, and infantry and naval forces ammunition. Its primary client is the General Headquarters of the UAE Armed Forces, with which it signed a contract to guarantees future supply of small caliber ammunition, but Tawazun aims to serve the ammunition needs of regional states as well.

Drones: Adcom Systems initiated unmanned systems production in the UAE. Created in the late 1980s by Emirati national Ali Al Daheri, the company has been manufacturing advanced aeronautical products such as jet-powered, remote-controlled unmanned aircraft (drones), used as targets by trainee air force personnel.[179]

An unmanned aerial vehicle from Adcom Systems. *Image Credit*: Yuriy Lapitskiy, Flickr. Licensed under Creative Commons.

178 Derek Baldwin, "Munitions Factory to Boost UAE Rank in Defense Market," *Gulf News*, January 5, 2011. It also offers testing facilities for products such as body armor and smoke grenades to UAE companies.

179 Ivan Gale, "Defense Industry on the March," *National*, May 30, 2010.

Adcom has produced thousands of target drones for about twelve customer nations. The company is also focusing on unmanned aerial vehicles (UAVs), which includes a partnership with a Malaysian company, Composite Technology Research Malaysia. According to a report by *Defense News*, Adcom is also in talks for the sale of two of its Yabhon United 40 UAVs to the Russian military.[180] But before it finalizes a contract, Russia's military will conduct test flights of the drone and assess whether it meets its operational needs.

In early 2013, Abu Dhabi Autonomous Systems Investment (ADASI) and Boeing signed an agreement for the two companies to address the growing demand in the Middle East market for unmanned systems. The agreement between the Tawazun subsidiary, which is chaired by Homaid Al Shemmari, and the big US plane maker was signed at IDEX 2013. Company representatives said the agreement will enable ADASI to provide training, support and marketing services for Boeing's ScanEagle and Integrator unmanned aircraft systems in the UAE, with prospects to expand into the Middle East and North Africa region.[181]

A year earlier, Tawazun announced that it partnered with the Dynamics division of Denel to build the Middle East region's first facility for the development, manufacture, assembly and integration of precision-guided systems for conventional air munitions. The JV, known as Tawazun Dynamics, is owned 51 percent by Tawazun and 49 percent by Denel. The first customer for the initial system will be the UAE Air Force and Tawazun Dynamics will both supply precision-guided weapon systems as well as product system management services to the UAE Air Force and other international clients.[182] In November 2013, the UAE military acquired the Al-Tariq guided bomb kit, according to Hamad Al Marar, the general manager of parent company Tawazun. Valued at $490 million, this is reportedly Tawazun Dynamics' biggest contract since it was founded in September 2012. Tawazun Dynamics announced on November 19, 2013, that its integration of Al-Tariq aboard the UAE Air Force's Dassault Mirage 2000 aircraft was successful. It is only logical that the company would explore next the possibility of doing the same for the UAE Air Force's Lockheed Martin F-16E/F Desert Falcon fighters, or they could wait for integration with the Mirage fleet's Rafale, Typhoon, or Super Hornet successor.[183]

Shipbuilding: Created in 1996, Abu Dhabi Ship Building (ADSB) conducts naval construction, repairs and refits in the UAE and the Gulf. The company, which is 40 percent owned by Mubadala, 10 percent by the Abu Dhabi government, and 50 percent by numerous Emirati investors, reportedly employs more than 1,200 people and has the only shipyard in the region to deliver complex products and services to the GCC navies, coast guards and other military, paramilitary, and commercial vessel operators throughout the region. Its new shipyard was opened in 2002, and Abu Dhabi seeks to turn it into a world class facility able to construct a wide range of military, paramilitary and commercial vessels in steel, aluminum, and composite materials.

In July 2012, ADSB launched its indigenously developed first-ever Ghannatha class missile patrol boat for the UAE Navy. Abu Dhabi instructed ADSB to construct twelve new missile boats and retrofit the existing Ghannatha Phase One troop carriers into gun and mortar boats. The UAE Navy is expected to take delivery of the twelve vessels worth $254.5 million by 2014.[184] The huge Ghannatha Phase Two program, which was awarded to ADSB in 2009, was made possible, like its predecessor, by a strategic partnership with Swede Ship Marine, a Swedish company. Abu Dhabi Systems Integration and the Italian firm SELEX Sistemi Integrati are responsible for all integration activities. Swede Ship Marine provided the basis design and built three of the Ghannatha class boats. The first was

180 Mustafa, "With Adcom Drone, UAE Makes BigExport Push."

181 McGinley, "Saudi Arabia Builds Unmanned Aircraft."

182 Wam, "UAE firm Launches Manufacturing Facility for Precision-guided Weapon Systems," *Emirates 24/7*, September 20, 2012.

183 Mohammed Najib, "Dubai Airshow 2013: UAE Signs up for Al-Tariq Guided Bomb Kit," *IHS Jane's 360*, November 19, 2013; "Mirage Fighter Jet Implements Tawazun's Al Tariq System," *Defenseworld.net*, November 19, 2013.

184 "IDEX 2013—UAE Fighting Vehicles," *Military Technology*.

commissioned in early 2003 and the remaining eleven ships were delivered in the following eighteen months. Capable of maneuvering at all speeds and operating at shallow waters, these boats are meant to deploy troops directly onto a beachhead via a hydraulically operated bow ramp. But they can also serve as a command, control, and communication center, surveillance, interception, and anti-surface warfare operations in territorial waters and exclusive economic zone (EEZ). ADSB is also completing the production of twenty-two fast interceptor boats for the Critical Infrastructure and Coastal Protection Authority (CICPA).

The six-ship Baynunah Corvette program is the UAE's flagship naval program. It is reportedly the largest and most ambitious naval shipbuilding project in the Gulf. Baynunah Corvettes, which are developed by the French company CMN but built by ADSB,[185] have multi-mission capabilities including coastal patrol and surveillance, mine detection and avoidance, helicopter operations, as well as anti-air and anti-surface capabilities. In February 2014, ADSB delivered Al Hili, the sixth and last of the Baynunah program.[186]

Rockets: Established in 2006, Emirates Advanced Investments is at the forefront of the rocket industry in the UAE and is currently jointly developing laser-guided rockets with the US defense company Raytheon. The General Headquarters of the UAE Armed Forces has awarded Tawazun a contract for Raytheon's TALON Laser Guided Rocket. Under the terms of the contract, Tawazun will maintain a full integration of TALON system into the UAE armed forces' existing rocket system and deliver a training program on the systems for armed forces personnel. TALON is a lower cost, digital semi-active laser guidance and control kit that integrates directly to the front of legacy 2.75 inch Hydra-70 unguided rocket. Local companies have been able to meet the UAE's unique requirements with developments such as the massive Jobaria Defense Systems-made Multiple Cradle Launcher, an extraordinary, multiple-launch rocket system capable of firing 240 unguided artillery rockets in 2 minutes. The system, displayed at IDEX 2013 for the first time, was developed indigenously in three years and is in service in the UAE army.

185 Although the first ship was built in France and the remaining five in the UAE.

186 "UAE Navy Gets Sixth Baynunah Corvette Class Ship," *Khaleej Times*, February 8, 2014.

Recommendations

Saudi Arabia and the UAE's defense-industrial accomplishments notwithstanding, embarking on a successful path to domestic military industrialization could, depending on the desired objectives, require nothing short of a total state effort and a societal transformation. Political stability, national leadership, and relative abundance of financial capital in Saudi Arabia and the UAE have been crucial to getting military industrialization off the ground, but to develop, rationalize, and sustain the process for the long term both countries stand a better chance of succeeding if they implement the following set of recommendations:

Clarity of Purpose and Strategy: For the process of Saudi and Emirati military industrialization to yield optimal results, it must have a more precise strategic and tactical purpose. Riyadh and Abu Dhabi seem to have decided (rightfully so) that high-tech and small-scale is the best way forward, but both capitals need to more clearly determine the types of economic and military-industrial strategies for pursuing this model.

If national security is the dominant reason for building a domestic defense industry, then Saudi Arabia and the UAE ought to think more seriously about ways to effectively integrate the process of local arms production into the broader context of national defense policy and arms acquisition. At present, there does not seem to be real linkage between arms acquisition and arms production, as both processes mostly operate in separate ways and have their own strategic and economic logics. Simply put, Riyadh and Abu Dhabi should realize that what they decide to buy has an impact on what they wish to produce.

Defense Production Policy: Neither Riyadh nor Abu Dhabi seems to have a defense production policy. Defense production policies are important in that they concisely and transparently articulate the agendas of both countries' ministries of defense for supporting a domestic defense industrial base, rather than couching these intentions in dense procurement documents. Moreover, such policies would highlight the need for greater involvement by the private sector (including small- and medium-size enterprises) and for broadening both countries' defense R&D bases. Saudi and Emirati arms procurement plans and decisions are based on threat scenarios that are primarily driven by the Iranian military and asymmetric potential. Consequently, arms procurement is almost exclusively reactive. And it is not clear if an overarching body for long-term planning exists in Riyadh and Abu Dhabi, or any comprehensive security policy document. This is important for consistency between short-term decisions and long-term plans.

Organization of Defense: Defense industrialization cannot take place in an institutional vacuum. The process would gain tremendously if Riyadh and Abu Dhabi organize their national defense establishments by creating credible and authoritative institutions as well as solid legal and administrative frameworks. Should defense ministries in Riyadh and Abu

Dhabi assume key defense-related powers and refrain from relegating them to kings or military commanders, military industrialization would profit. That's because such institutions are ideally suited for organizing defense forces and preparing defense objectives, plans, strategies, and even doctrines. The United States can assist its Saudi and Emirati partners by devising organizational designs that help support sound civil-military relations. However, given the profound differences between the US, and Saudi and Emirati political, military, and cultural systems, "surgical transfers" will not work and thus must be avoided.

Technology Transfer: A diverse approach that addresses actual needs and realities would be most beneficial to Saudi Arabia and the UAE. Riyadh and Abu Dhabi should continue to adopt a deliberate policy of training their nationals and encouraging them to learn skills on the job. This will require even greater attention to and development of the Saudi and Emirati educational sectors. Raising the bar with respect to Saudi and Emirati scientific and technical education will require not only efforts to improve the quality of teaching and the relevance of curricula, but also specific measures to provide incentives for the population to attend schools at the primary and secondary levels. Technology transfer has been beneficial to Saudi Arabia and the UAE, but it is also no panacea. A more educated and better-trained local labor force is needed for technology transfer to achieve optimal results in Saudi Arabia and UAE.

Research & Development and Science & Technology: The development of a more robust local R&D capability in Saudi Arabia and the UAE should be another priority. What currently exists in both countries is simply inadequate. Such a capability should have more direct interaction with the users—the armed forces and foreign clients. To facilitate and manage this interactive process, a coordinating body in each country should be created. Advances in R&D also have to correspond to S&T levels in user organizations. There is no benefit in boosting local R&D capabilities if absorption, adaptation, and diffusion of advanced technologies is lagging or not taking place at all.

Private Sector Participation: Fortunately for Saudi Arabia and the UAE, their governments do not lack financial capital, which allows for the aggressive pursuit of military industrialization. But having significant financial resources is one thing, and knowing how and what areas to fund to promote the process is a different thing altogether. Saudi Arabia and the UAE need to ensure a greater role for the private sector in the funding process. Otherwise defense production would remain wholly state-owned, which works against the streamlining of defense industrial activity. Greater coordination between the public and private side of the Saudi and Emirati defense sectors is a must.

Offset Programs: Saudi Arabia and the UAE should further integrate their offset programs into national strategies for industrial development. Currently, it is hard to see real linkage between Saudi and Emirati offset programs national industrial strategies.

While Saudi and Emirati defense companies have been able to secure a number of international deals recently, it remains a big question whether they can succeed at doing so without political favors and the interventions of their governments. Furthermore, the strength of local Saudi and Emirati businesses in high-tech capabilities will continue to be dependent on US and transatlantic companies, at least in the medium term. In order to reduce such dependency, Saudi Arabia and UAE must maximize the effect of job creation. Both countries would benefit from the lesson of South Korea by shifting the offset policy paradigm from current defense core technology transfer to job creation, export industrialization, and small and medium enterprises.[187]

From the perspective of the US defense industry, Saudi Arabia and the UAE would also benefit from making their offset programs more flexible and their offset policies more adaptable for companies. "They are currently shooting themselves in the

187 Won-Joon Jang, Young-Su Ann and Mi-Jung Kim, "Job Creation Effects Using Defense Offsets in Korea," *DISAM Journal of International Security Cooperation Management,* July 29, 2013, http://www.disamjournal.org/articles/job-creation-effects-using-defense-offsets-in-korea-1019.

foot,"[188] one prominent US defense industry executive said, "…because as much as we agree with their policies of emphasizing the training of their own people and staffing joint venture companies with locals—the challenge at present is that there are not enough local managers, experts, administrators, manufacturers, scientists, and technicians, and even those who are available, are not fit for the job."[189] Another perspective from the British defense industry expressed serious concern about lack of transparency and accountability with regard to Saudi and Emirati defense programs. "How real are these programs?" said one representative.[190] "Transparency is lacking and it negatively affects business investment. There is also not a clear acquisition procedure… how do you recover your investment? What is the sustainability of these programs?"[191]

Maintenance, Repair, and Overhaul: Saudi Arabia and the UAE have understood the positive effects of MRO on national economics, job creation, and defense planning, and thus have enhanced their MRO capabilities over the years. Saudi Arabia and the UAE have established several MRO companies that have helped ensure, although only partly, the operational readiness of their militaries. Importantly, the UAE's Mubadala, Tawazun, and EAI have signed on April 3 a Memorandum of Understanding in Abu Dhabi to explore the synergy opportunities that could be created by the unification of their defense businesses and specifically, the consolidation of their MRO operations.[192] The creation of an integrated defense industrial platform in the UAE brings significant economic benefits, rationalizes the supply chains, and establishes a single point of contact for customers.

But it will take some time before Saudi and Emirati technicians and engineers, as few as they are, are able to maintain modern US and other Western weapons systems without the help of foreign workers. For example, the challenge of autonomously maintaining a US weapons system can be particularly challenging, given its complexity. The US Airborne Warning and Control System (AWACS) experience, and how the Saudis have had massive difficulty maintaining the units since the 1980s, is telling. In May 2006, a major exercise called Peace Sword was conducted to test the proficiency of the Saudi AWACS fleet. According to a 2009 RAND study, the exercise identified serious deficiencies with maintenance and other logistics areas. This prompted a joint US-Saudi "across-the-board review" to assess the state of the Royal Saudi Air Force.[193] Some US weapon systems, like AWACS, bring with them specific maintenance and logistics procedures, policies, and even a philosophy, all of which are based on US culture. This example and others suggest that further focus on and investment in MRO capabilities is needed in Saudi Arabia and the UAE.

Bilateral or GCC-wide Military Industrial Cooperation: Because Saudi and Emirati military procurement and production processes have much in common, there is room for bilateral cooperation and collaboration, which could result in the development of a joint MRO base and an

188 Author's interviews with several US defense industry executives who have extensive experience in the UAE and Saudi Arabia and portfolios in both countries, Washington, DC, March 20, 2014.

189 Ibid.

190 Author's interview with a UK defense industry epresentative who has more than twenty-five years of experience handling large contracts in the Gulf, March 12, 2014.

191 Ibid.

192 "Mubadala, Tawazun and Emirates Advanced Investments sign Memorandum of Understanding," Zawya, April 3, 2014, https://www.zawya.com/story/Mubadala_Tawazun_and_Emirates_Advanced_Investments_sign_Memorandum_of_Understanding-ZAWYA20140403103817/.

193 Jennifer D.P Moroney, ed., *International Cooperation withPartner Air Forces* (Santa Monica, CA: RAND Corporation, 2009), p. 37.

integrated or complementary services and production infrastructure. This would be hugely profitable economically, as it would allow for maximal exchange of experience and skills, as well as fuller, more prolonged use of facilities and qualified manpower.

The logic of industrial collaboration in arms development and manufacturing between Saudi Arabia and the UAE, and perhaps with other Arab Gulf states in the GCC is sound, but also not new. GCC summits have addressed this issue several times in the past but no progress has been made yet. The 1970s model of Arab industrial collaboration, which was spearheaded by Egypt, failed not on economic grounds but on political ones. It is possible, however, that the threat of Iran and uncertainty in the US-Gulf partnership become the catalysts for greater military cohesion among the Arab Gulf states. In December 2013, the GCC announced at the end of its summit that its members would create a joint military command to coordinate their defenses. But it is not clear how political differences will be managed and whether the project will ever see the light. After all, the GCC has been calling for such a joint defense network since the early 1980s when the GCC was formed.

Implications for US Policy

The Obama administration's 2012 Defense Strategic Guidance and US Central Command (CENTCOM)'s 2013 Posture Statement call, among other things, for shifting the focus of US military planning to the Asia-Pacific. Successful implementation of US global reposturing strategy requires, in part, that the United States revise its defense strategy, shape its military presence, and recalibrate its level of political engagement in the Middle East, and specifically, in the Gulf. Doing so necessitates, among other things, the support of willing, politically stable, and capable regional partners that can effectively share the burden of Gulf security. Given their wealth, modern armed forces, increasing regional clout, and strategic relations with the United States, the support of Gulf partners will arguably be counted on the most by Washington. The United States understands that bolstering the defense and security capabilities of its Gulf partners, a vital mission emphasized in the 2006, 2010, and 2014 Quadrennial Defense Review (QDR) reports, will help it tackle a range of threats and challenges in the Middle East and execute in the long term its strategic pivot to the Asia-Pacific.

Therefore, efforts by Saudi Arabia and the UAE over the past decade to upgrade their national defense capabilities by purchasing arms and pursuing domestic military industrialization contribute to US strategic plans and interests in the Middle East and are generally consistent with the broader commitment by the United States to expand its global partnerships and strengthen its friends and allies' defense capabilities.

Potential Risks

Should current political uncertainties in US-Gulf relations persist and, more dramatically, a strategic rift between Washington and Riyadh develop in the future due to major policy differences, intensified defense industrialization in the Gulf could carry risks to US strategic interests in the Middle East.

While there has been uncertainty in US relations with Gulf partners since the start of the Arab uprisings in late 2011 due to differences over policy toward Syria, Egypt, and Iran, such relations are not at a crossroads. The partnership is strong, and US and Arab Gulf officials understand that there is too much at stake to preserve its strength and endurance. For more than four decades, the United States has had a robust web of partnerships with the states comprising the GCC. This system has achieved common strategic goals, including securing the free and constant flow of oil from the region to the world at large; preventing the rise of a hostile regional power that could threaten Middle East stability; and countering Islamist extremists that seek to violently transform politics and society. The relevance and importance of these goals in today's strategic and regional environment have only increased. However, such pillars could face increasing pressures due to historic political transitions in the region and what seem to be tectonic shifts in Gulf politics.

Almost all Arab Gulf countries are frustrated with some aspect of US policy in the Middle East. But Gulf concerns are not equally serious or consequential, and Gulf countries have responded to their dissatisfaction with US policy very differently. While the UAE has had concerns about Washington's Iran and Egypt policies, it has not veered away from the partnership and has refrained from publicly showing its displeasure with Washington. This is in clear contrast with Saudi Arabia, which, until recently, had deliberately chosen a public approach to its row with Washington. Riyadh's bizarre rejection of a UN Security Council seat last year, which was intended to send a message to the United States but arguably ended up hurting Saudi Arabia more than anything else, is one example of Saudi open disapproval of Washington. More significant, however, is Saudi Arabia's aggressive pursuit of new friends, a process which has ironically been termed as the Kingdom's own "pivot to the east," and one that actually precedes the US declared pivot to the Asia-Pacific by almost a decade.[194] Over the past few months, Saudi officials, led by Crown Prince Salman Bin Abdulaziz Al Saud, held a series of high-level meetings and signed important memorandums of understanding (some defense-related) with their counterparts in China, India, Japan, Pakistan, Indonesia, and other Asian countries. While it is often said that Saudi Arabia does not really have reliable partners other than the United States, Riyadh is serious about not putting all its eggs in one basket and has been exploring other options for some time.

Going It Alone?

Given Saudi Arabia's size and traditional leadership role in the Arab Gulf, its views of and massive current disappointment with US Middle East policy deserves closer scrutiny. Saudi policies and actions have the potential to cause a dramatic overhaul of US strategy toward the Middle East and specifically upset Washington's old system of partnerships in the Gulf, which in many ways has been the anchor of Gulf stability. Should a strategic rift develop between Saudi Arabia and the United States in the future (which is likely but not inevitable), the Kingdom's potential unilateralism, bolstered in part by more developed indigenous defense and security capabilities, might cause Washington to seriously worry about threats to its interests in the Middle East.

It is worth recalling that one of the motivations of Saudi Arabia and the UAE to pursue military industrialization is to reduce their political dependence on the United States. Unilateralism on the part of US friends and allies can sometimes undermine security interests, as evidenced by Israel's unilateral military actions in Lebanon, Syria, and the Palestinian Territories.[195] The United States has often favored and called for regional solutions to many of the Middle East's security problems, and Washington would be relieved if Saudi Arabia and/or the UAE could step up and use their own defense and diplomatic resources to defuse a potential crisis in the future. However, if another *major* crisis, a la 1990-91 Gulf War, occurs and the Saudis and/or the Emiratis decide to act on their own to protect their interests outside the confines of the US-Gulf partnership, US strategic interests might be at risk.

While Saudi Arabia's current *capacity* to act more independently from the United States is lower, its *willingness* will only increase should relations with Washington fail to improve and its defense industrialization effort develop at a more rapid pace. This equation is almost reversed with the UAE. Abu Dhabi's capacity to act more independently from the United States is higher (its armed forces are more technically proficient and combat-ready than the Saudi military) and will only strengthen with time, but its willingness to do so is decreased because it much prefers to work with US-led, international coalitions. This explains why Abu Dhabi is interested in strengthening its partnership with NATO and vice versa. Areas that the UAE considers as priorities in its partnership with NATO include energy security, cyber security, counterterrorism, maritime security, nonproliferation, and expanded

194 Bruce Riedel, "The Saudi Pivot to Asia," *Al-Monitor*, March 13, 2014.

195 Israel could also choose to attack Iran alone should it feel threatened and unsatisfied with a potential international deal over Tehran's nuclear program.

military cooperation. Like Saudi Arabia, the UAE has regional leadership ambitions, but it prefers to lead by example, and its foreign policy outlook tends to be more global and cosmopolitan than Saudi Arabia's.

A Joint Responsibility

The sustainability of the US-Gulf partnership is a joint responsibility, despite Washington's senior status. The Arab Gulf countries, and Saudi Arabia and the UAE in particular, have obligations too. Building closer security relationships and integrating national defense capabilities (most importantly in air and missile defense) should be more pressing priorities for Arab Gulf leaders. Interoperability is also not a one-way street. Washington has been adamant about its Gulf partners maintaining compatibility with US defense systems. However, often times, requests by Gulf partners for the purchase of US items that would uphold US-GCC and inter-GCC interoperability are denied by Washington. The two major reasons for this are strict export controls and a US Israel policy of Qualitative Military Edge (QME), designed to maintain Israel's regional military supremacy and deterrence posture. In the Gulf partners' view, the problem is not limited to US rejection of its requests but also to Washington's slow or lacking response. Sometimes it takes years to get an answer from Washington for a specific military purchase, and by the time a response is provided the price as well as the needs and circumstances of the Gulf partners would have changed.[196] "The process is just too slow and cumbersome, and it needs major upgrade and adaption to new global trends and realities," one Gulf military commander recently said.[197]

Saudi Arabia and the UAE are not the only US partners to complain to Washington about limitations on US technology transfers. Others have also had expectations from the partnership, which they feel have not been met by the US side. Close cooperation with Washington, some US transatlantic partners say, should come not just with political benefits, but also with economic and technological ones. Italy, for example, claims that US compensation for its valuable military assistance to the US-led coalitions in Iraq and Afghanistan has been inadequate, arguing that Washington should be more flexible with regard to Rome's requests of technology transfers. Even the UK, arguably the closest US ally in the world, has asked Washington to waive some licensing requirements on military technology transfers, but to no avail. The United States appreciates the risks and costs of increasing dissatisfaction of its allies, but such a realization doesn't make its policy dilemma any less difficult. The United States is fully aware that it needs to further relax and update its export controls and share its industrial know-how and technology with its allies to receive the best cooperation from them. For national security reasons, however, the United States cannot share all of its technologies. The US government is thus left to make these decisions on a case-by-case basis, which is not optimal and will always carry the risk of upsetting or offending an ally.

A GCC in Disarray

But Saudi Arabia and the UAE shouldn't rely solely on US cooperation. There is ample room for defense-industrial cooperation and collaboration between Riyadh and Abu Dhabi and other GCC capitals, be it in manpower, skilled expertise, manufacturing and/or MRO, that can address some deficiencies. The problem is that politics, rivalry, and prestige have stood in the way of such a goal. The United States has been pushing the GCC to think more collectively for some time, but disagreements among its members, be it on Syria, Egypt, or Iran, are real. Currently, relations between Qatar on the one hand, and Saudi Arabia, Bahrain, and the UAE on the other, are tense, due to sharp divides over policy and strategy in the region.[198]

196 The author would like to thank Danny Sebright, president of the US-UAE Business Council, for sharing this observation.

197 Author's interview with a Gulf military commander, summer 2013, Washington, DC.

198 Bilal Y. Saab, "Break Up in the Gulf: What the GCC Dispute Means for Qatar," *Foreign Affairs*, March 6, 2014.

On March 5, Saudi Arabia, the UAE, and Bahrain announced that they had withdrawn their ambassadors from Qatar, claiming that Doha had been violating a clause in the GCC charter banning interference in the domestic affairs of fellow GCC members. The decision, unprecedented in the GCC's history, hints at significant changes to come for the GCC and the balance of power in the Gulf. It might even signal the death of the GCC and herald a new power alignment in the Gulf should Qatar get closer to Oman and Iran, with whom it already has good relations. It would also severely complicate US plans in the Middle East. With increasing tensions among GCC members, Washington may come to see that its Gulf partners will not be able to provide regional security anytime soon and, as a result, think twice about plans to reduce the US political and military footprint there. Qatar's spat with its Saudi and Emirati neighbors also creates another policy dilemma for the United States. Washington has strategic relations with all three states, which will become difficult to manage if they aren't on speaking terms.

On April 18, Gulf foreign ministers met in Riyadh in a bid to defuse the crisis with Qatar. Despite a statement by Omani Foreign Affairs Minister Yusuf Bin Alawi that the issue was resolved, it is still very much unclear what the Gulf officials agreed on and how they intended to implement their alleged political settlement. After all, policy divergences among the Gulf countries are anything but minor, and it matters greatly still which strategic path Doha chooses to take in the future. So long as political discord reigns in the GCC, the US-Gulf partnership, with its defense-industrial component, will never meet its true potential and remain limited to bilateral affairs between the United States and individual GCC members.

Conclusion

Military industrialization in Saudi Arabia and the UAE is a natural consequence of both countries' ambitions to affirm their rising regional status as well as their efforts over the years to modernize their societies and diversify their economies.

Despite Saudi and Emirati achievements in the defense sector over the years, many in Washington remain unimpressed or skeptical. Some express serious doubts over either country's ability to reduce its technological dependence on the United States and heavy reliance on foreign expertise and manpower. Some also do not believe that Saudi Arabia and the UAE are capable of making the necessary political and economic reforms that would allow their arms manufacturing efforts to attain higher levels of effectiveness and efficiency. Still others ascribe present Saudi and Emirati defense industrial weaknesses to cultural differences with Western societies and see little hope for the future.

Some of these concerns are legitimate, but much of the criticism too quickly dismisses the significant military industrial advances of Saudi Arabia and the UAE over the past decade, exaggerates, or misdiagnoses the existing challenges, and unfairly sets the bar too high by comparing present Saudi and Emirati defense industrial conditions to the United States and its European allies and partners. Putting Saudi and Emirati achievements on equal footing would also be inaccurate. There is a consensus among defense industrial experts that the UAE is far ahead in its military industrial effort, although Saudi Arabia has a bigger potential given the size of its market and much more significant, albeit untapped, human resources.

The pace, scope, and effectiveness of Saudi and Emirati military industrialization efforts will continue to depend, in many respects, on broader societal change in both countries. But it would be misleading to say that the Saudi and Emirati political systems, because of their restrictive attributes—including secrecy, excessive centralization, exclusionism, corruption, and lack of accountability—totally obstruct military industrialization. Liberal democracy is not a prerequisite for successful military industrialization. Furthermore, arguments based on cultural determinism are unhelpful. What matters most when it comes to successful military industrialization is intent, vision, resources, and a set of sound political, economic, and military industrial strategies. Saudi Arabia and the UAE still struggle with the formulation of such strategies, but they are gradually improving and learning from the top defense companies in the world, by way of collaboration and partnership.

It bears repeating that military industrialization in Saudi Arabia and the UAE is a long-term process. Indeed, it is likely to take anywhere between five to fifteen years before either country can effectively export military items *en masse* and increasingly rely on its own local manpower and arms production capabilities to address national security needs. Riyadh and Abu Dhabi are careful not to rush the process, and they have every reason to be confident about the future.

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