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Syria and WMD

Incentives and Capabilities

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Syria and WMD
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Abstract (not more than 200 words)

The altered situation in the Middle East after the fall of Saddam Hussein in March 2003, brought Syria into the limelight in regards to several factors, mostly to its alleged possession of weapons of mass destruction (WMD). In order to understand the altered security context in the region and its implications on Syria's deterrence policy, a study examining Syria's incentives and capabilities regarding WMD and means of delivery is indispensable. The intentions behind this report are to describe both incentives and disincentives of some nations' procurement, and development of WMD. It is also an attempt to give an insight into Syria's existing offensive programs that might be a legacy of the demands from the previous Cold War era. However, it also shows that the tense situation in the Middle East as of April 2004, has created an atmosphere in which Syria regards the use of WMD to be their sovereign right when it comes to deterrence primarily against the state of Israel.

Keywords

Weapons of mass destruction, Nuclear Weapons, Biological Weapons, Chemical Weapons, Ballistic missiles, Syria, Middle East, Security Policy, Deterrence

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Sammanfattning (högst 200 ord)

Den förändrade situationen i Mellanöstern efter att Saddam Husseins regim störtades från makten i Irak i mars 2003 har medfört ett ökat fokus på Syrien, bland annat med anledning av landets misstänkta innehav av massförstörelsevapen (MFV). För att förstå den förändrade säkerhetspolitiska situationen och dess effekt på Syriens avskräckningsstrategi, är det nödvändigt att studera Syriens kapacitet för MFV, dess vapenbärare samt bakomliggande drivkrafter. Syftet med rapporten är att beskriva både drivkrafter och återhållande faktorer för vissa staters anskaffning och utveckling av MFV. Rapporten syftar även till att försöka ge en insikt i Syriens existerande offensiva program som kan utgöra ett arv från det Kalla kriget. Studien visar även att den spända situationen i Mellanöstern i april 2004 har skapat en omgivning i vilken Syriens regim anser sig vara berättigad till massförstörelsevapen för avskräckande syften, främst riktat gentemot Israel.

Nyckelord

Massförstörelsevapen, N-vapen, B-vapen, C-vapen, Ballistisk robot, Syrien, Mellanöstern, Säkerhetspolitik, Avskräckning.

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1. Summary

This study looks at Syria's intentions and capabilities regarding weapons of mass destruction (WMD). It argues that strong indications exist of a Syrian chemical weapons program. Syria most likely has a domestic production of nerve agents (sarin), and also production capabilities of corresponding means of delivery in the form of ballistic missiles and aerial bombs. This study has not found any indications that Syria is harbouring an offensive biological weapons program. However, Syria has a surprisingly well-developed pharmaceutical industry, and it could be argued that this capacity could be used for production in an offensive biological weapons (BW) program. In regards to nuclear capacity, all available information indicates that Syria today focuses its nuclear ambitions in the civil sector. Syria does not have any military nuclear program ambitions, and the lack of economical and technical resources needed for such a program are vital arguments behind this conclusion.

The international community's concern in regards to WMD in the Middle East has changed from being "fairly moderate" in the 1970s and 80s, to the present view of the "greatest security risk of this decade," and this has affected the present Syrian security policy context. After the war on Iraq in 2003, and the Libyan denouncement of WMD, the Syrian regime has been forced to enhance its strategy to counter international allegations of WMD ambitions and possession. The evident Syrian strategy, when examining recent statements made by Syrian President Bashar, is to justify possession of any weapons, by the fact that the country is at war against a state party (i.e. Israel), which is generally considered to possess a large nuclear arsenal. International demands of Syrian renouncement of WMD have also repelled towards Israel by Damascus calling for the creation of a WMD-free zone in the Middle East region. Damascus also faces increased international pressure since it is often linked to other states having perceived WMD ambitions, such as North Korea and Iran. However, as long as Israel remains a nuclear state and a perceived threat by Syria, strategic deterrence including chemical weapons and ballistic missiles will most likely remain.

2. Introduction

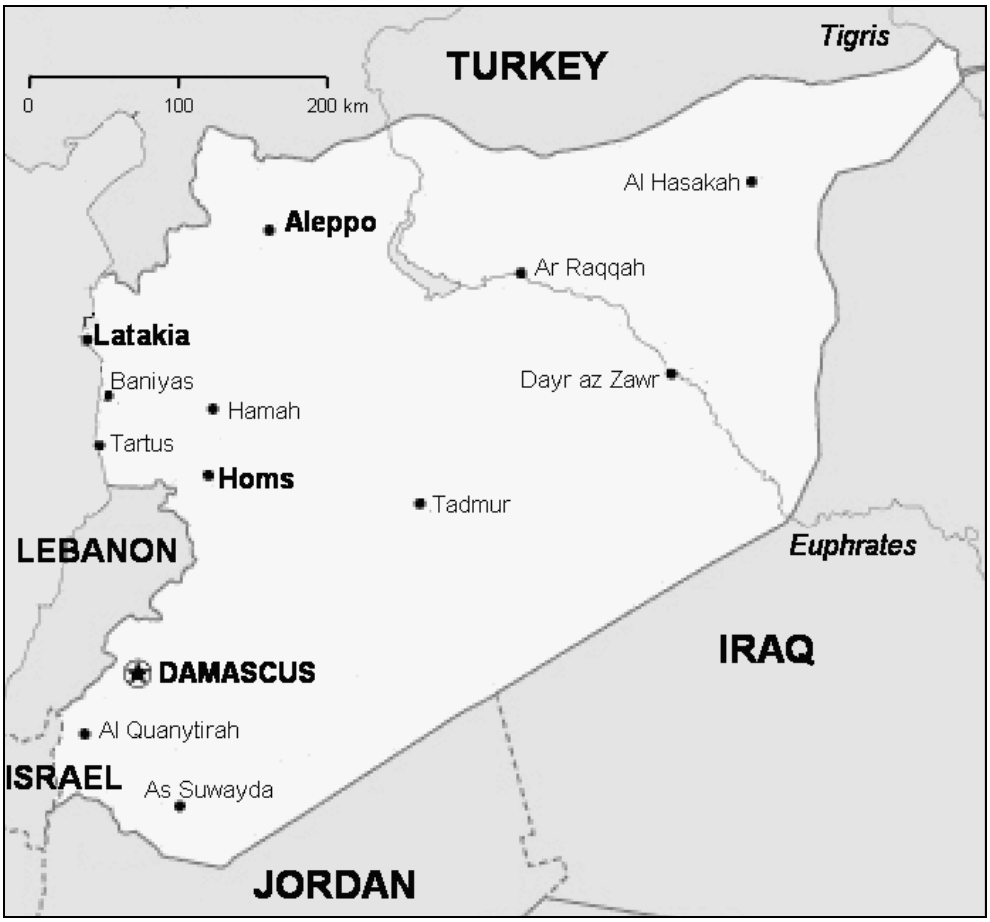
The altered situation in the Middle East after the fall of Saddam Hussein in March 2003, brought Syria into the limelight in regards to several factors, but mostly to its alleged possession of weapons of mass destruction (WMD). In order to understand the altered security context in the region and its implications on Syria's deterrence policy, a study examining Syria's incentives and capabilities regarding weapons of mass destruction and means of delivery is indispensable. There are many studies conducted on Syria's capacity, but there is an apparent lack of an in-depth report regarding the incentives and capabilities behind its suspected WMD programs. The intentions behind this report are to describe incentives and disincentives of some nations' procurement, and development of weapons of mass destruction. In addition, an understanding of these incentives and disincentives can assist policymakers in their interactions with a nation like Syria. It is also an attempt to give an insight into those existing offensive programs that might be a legacy of demands from the previous Cold War era. However, it also shows that the tense situation in the Middle East as of April 2004, has created an atmosphere in which Syria regards the possession of weapons of mass destruction to be their sovereign right when it comes to deterrence primarily against the state of Israel.

Due to lack of any consistent and stable leadership in Syria prior to the 1970s, there is little evidence of a Syrian WMD program until Hafiz al-Asad gained power in 1970 and instituted a long-term security strategy, including weapons of mass destruction ambitions. Therefore, this study is limited to the 1970-2004 time period. The report is also limited to political, educational and scientific factors relevant to, and connected with, the potential need/procurement/ development of WMD, and does not, for example examine the issues of terrorism and terrorist organisations supported by Syria. It has been conducted using a qualitative method having certain limitations, and is exclusively based on open source information. Due to language limitations, no sources written in Arabic have been used, only translated material. It is crucial to keep in mind that much of the material in this report is based on Western and Israeli sources that might appear biased. For example, it became evident that there exists a vicious circle of cross-referencing in articles published on Syria (see Appendix 1; Critical Source Reading).

The study consists of six chapters, organised to provide the reader with the critical context to understand Syria's incentives and capabilities in regards to WMD. Chapters 1 and 2 provide an introduction to this study and a brief presentation of Syria. Chapter 3 gives an overview of the past and present security policy context against which Syria's WMD program has developed. In Chapter 4, Syria's incentives for WMD acquisition and justification for such weapons are presented. Chapter 5 deals with Syria's capabilities within research

and development and its domestic industry. Nevertheless, it mainly concentrates on Syrian nuclear, biological, chemical and ballistic missile ambitions.
In Chapter 6 the findings regarding Syria's WMD ambitions and incentives are discussed. It also provides a discussion of future trends regarding Syria's policy seen from a WMD perspective.

3. Syria



Syria is officially known as Al Jumhuriyah al Arabiyah, as Syriyah, or the Syrian Arab Republic. Syria can be traced back to approximately 2500 to 2400 BC as being the centre of one of the most ancient civilisations on earth. The capital Damascus was founded in 2500 BC. Prior to the 20th century, the whole region from the eastern end of the Mediterranean Sea (including Syria, Lebanon, Jordan and Israel) was called Syria.[1] Syria has a turbulent past and was consecutively occupied by Canaanites, Phoenicians, Hebrews, Arameans, Assyrians, Babylonians, Persians, Greeks, Romans, Nabataeans, Byzantines, Arabs and Crusaders before coming under the Ottoman Empire in 1516, which lasted for four hundred years. In 1920, following World War I, Syria came under French occupation following the Sykes-Picot agreement, which divided the Middle East into British and French spheres of influence. The French mandate lasted until April 1946 when the last French soldier left Syrian territory and thus Syria gained its independence. In 1958, Syria and Egypt formed the United Arab Republic

[1] Also referred to as Greater Syria by many historians to denote the area in the pre-state period.

which lasted for three years until Syria proclaimed its renewed independence. Syria then entered a time of political instability, including several military coups; in 1960, 1961, 1963 and 1966. General Hafiz al-Asad seized power in 1970 through a bloodless military coup and established an authoritarian regime. Hafiz al-Asad remained in power until his death on June 10, 2000, and was succeeded by his son Bashar al-Asad a month later.

Modern Syria is located in the heart of the Middle East, surrounded by Israel, Lebanon, Turkey, Iraq and Jordan. Thus, Syria perceives itself to be encircled by hostile neighbours, and most of the Syrian forces are arrayed against Israel, which is viewed to be the major external threat to Damascus. In order to avoid regional isolation, Syria has maintained close ties with Iran, and also with Iraq until March 2003 when the Saddam Hussein regime collapsed.[2] Using the number of armed forces, military budget and weapons holdings as indicators, this region has an extremely soaring intensity of militarization with 2.9 million men under arms.[3] Additionally, within the last 10 years, the military spending in the Middle East has risen from US$ 52.3 billion to US$ 72.4 billion,[3] an increase of approximately 38%. In 2002, Israel alone increased its defence budget by US$ 10 billions, most likely linked to the "the Arrow" missile defence system, and the Arab states followed suit. Subsequently, second to East Asia, the Middle East is considered the most heavily armed region in the world today, and most nations in the region possess ballistic missiles. After Iraq's defeat in the Gulf War, its dismantlement and the U.S. occupation have turned Syria into the nation which "possesses some of the most advanced strategic weapons among the Arab states."[4]

[2] See "Syria: Ballistic Missile Programs," URL<www.safefoundation.org/moreinfo/syria_missile.html >
[3] See Mölling, Christian and Neuncheck, Götz, "Military Capabilities in the Near and Middle East," *International Network of Engineers and Scientists Against Proliferation (INESAP)* URL<www.inesap.org/bulletin21/bul21art05.htm>
[4] Kozyulin, Vladim "Syria's Missile Deterrent: Final Breakthrough?" PIR Arms Control Letters, October 2000. URL<www.pircenter.org/board/article.php3?artid=434>

4. Past and Present Security Policy Context

Possible WMD capabilities in Syria today do not necessary derive from a current strategic objective in pursuing these weapons. In an effort to assess and highlight the main factors behind Syria's choice of strategic policy, which might have influenced its stance regarding WMD, this study has chosen to focus on the strategic events and developments in the region from as of the early 1970s, when Hafiz al-Asad came to power in Damascus. This focus emanates from the fact that there are few signs of Syrian ambitions when it comes to offensive WMD research to be found prior to the 1970s. Furthermore, Syria's pre-Asad era was characterised by repeated leadership shifts and thus an inconsistent security policy strategy.

4.1. Consistent security policy objectives

The policy objectives of the Syrian regime under Hafiz al-Asad have been consistent throughout the years and are characterised by the immediate and the all-pervading objective to maintain the secular Ba'ath regime in power.[5] Ever since Hafiz took the command in November 1970, the regime has been founded on a strong military and security service structure loyal to the president, who has ultimate power in all fields of the Syrian society.[6]

The recovery of the territorial integrity (Golan), along with the restoration of Arab pride, constituted the main objectives behind the Arab–Israeli War in 1973, and has been an intermediate goal of the regime since the 1967 War. As of 1990, Asad abandoned the option of a military solution to the Golan-dilemma realising that Golan only can be recovered through diplomacy, offering Israel full peace in return for a full Israeli withdrawal.[7] Furthermore, the influence over Lebanon is of outmost importance for the Syrian regime as a military and political leveraging against Israel, as well as an outlet for the increasing domestic economical demands.[8]

The long term goals are represented by the ideological ambition of the Ba'athist Socialist party to reach Arab unity. Still, ideology has always been side-stepped by Asad's national and regime security objectives, clearly marked by bold moves such as the intervention in Lebanon against the Palestinians in 1976, the support to Iran during the Iran-Iraq War, and the Syrian participation in the U.S.-led coalition during the Gulf War in 1991.

[5] George, A. *Neither Bread nor Freedom*, (Zed Books Ltd, 2003), p. 9.
[6] Decree 51 of March 9 1963 declares State of Emergency in response to the threat from Israel and is still in force in Syria as of April 2004.
[7] Weymouth, L. 'It's Good Saddam Is Gone; Bashar Asad talks about Iraq, Israel and WMD', Newsweek, 19 May 2003; and George, A. *Neither Bread nor Freedom*, (Zed Books Ltd, 2003) p. 20.
[8] Rabil, R. G. *Embattled Neighbors: Syria Israel and Lebanon*, (Lynne Rienner Publ., 2003), pp. 127-132.

4.2. Security Policy Strategy under President Hafiz al-Asad

The main elements of Syrian security strategy under Hafiz al-Asad can be portrayed by separating his time in power into three different periods; the alliance building strategy in the early 1970s, the strive for strategic parity with Israel from the late 1970s, and the necessity of a diplomatic solution to Syria's security dilemma beginning in 1990.

During his time as Minister of Defence, Hafiz believed in the idea of alliance building and military strength as vital components in order to gain influence in the region and to support Syria's confrontational policy vis-à-vis Israel.[9] The alliance building with Egypt in the early 1970s, and with Lebanon and Jordan (The Eastern Front) in the mid-1970s, failed as a means to reach the regime's goals. International and domestic events, such as the emerging Israeli-Egyptian approach towards a peace agreement and the Lebanese civil war demanded immediate Syrian involvement, effectively disrupting Asad's alliance building strategies. Syria's relations with the Soviet Union were of outmost strategic and economic importance during this period. Hafiz initiated a heavy military build-up, and the Soviet Union acted as a counterweight towards U.S. support to Israel, and as a deterrent against what Syria perceived as an Israeli aggressive policy.[10]

As of the late 1970s, the Syrian regime found itself under increasing pressure due to a costly involvement in Lebanon, tense relations with Iraq, domestic anti-regime violence and increased threat from Israel, which was further underlined by the Camp David Peace Agreement, and increased U.S. support to Israel. Under these circumstances, Asad decided to confront Israel on its own by striving to achieve a strategic parity with the support of the Soviet Union. The objectives for the new strategy were to enable Syria to withstand an attack from Israel, allow Damascus to negotiate with Tel Aviv from a position of strength, and to provide an offensive option to liberate Golan from the Israeli occupation.[11] Asad signed a treaty of Friendship and Cooperation with the Soviet Union in October 1980. This was an effort to extract security guarantees under the Soviet nuclear umbrella, and to enhance the access to advanced military weapons and military cooperation.[12] A large-scale military build-up was initiated in 1978, and continued to the mid-1980s, when Michael Gorbachev assumed power in Moscow and reformed the Soviet Union's Middle East policy. Increased defence expenditures, and the loss of funding from the Gulf States as a response to Syria's support for Iran during the Iran-Iraq war, led to a looming economic collapse in Syria. The declining economy, followed by Gorbachev's decision to end the vast Soviet military support to Syria's strive for strategic parity, marked the end of the Syrian regime's strategy of a military option to achieve its strategic goals vis-à-vis Israel.

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[9] Rabil R. G. *Embattled Neighbors: Syria Israel and Lebanon*, (Lynne Rienner Publ., 2003), p.21.
[10] Karch E. *Soviet Policy towards Syria since 1970*, (Macmillan 1991), pp. 28-33.
[11] Rabil R. G. *Embattled Neighbors: Syria Israel and Lebanon*, (Lynne Rienner Publ., 2003), p. 175.
[12] Eisenstadt M. 'Arming for Peace? Syria's Elusive Quest for Strategic Parity', *The Washington Institute Policy Paper*, No 31(1992), pp. 26-27; and Karsh E. *Soviet support to Syria since 1970*, (Macmillan 1991), pp. 123-126.

At the end of the 1980s, the regime in Damascus realised the need to change its policy in search for a place for Syria in the U.S. led new world order. The aim was to preserve the status quo through enhanced dialogue and understanding with the U.S., and better relations with the west-orientated Arab states and Egypt. In July 1990, Syria had restored diplomatic relations with the U.S. and Hafiz had visited Egypt despite his earlier statement that he would never re-open his relations with Cairo as long as the peace treaty with Israel remained in force.[13] This new period of Syrian security policy would until Hafiz's death in June 2000. The new policy led Syria to the involvement in the coalition against Iraq in 1990-1991, and to the U.S. and Soviet-led Madrid Peace Conference and its following peace process, lasting from October 1991 to February 2000.[14]

4.3. New leadership under mounting U.S. pressure

On June 10, 2000, President Hafiz al-Asad passed away after 30 years in power and was replaced by his son Bashar. In 1994, Bashar had studied ophthalmology in the United Kingdom when Hafiz's eldest son, and presumed successor, Basil was killed in a car accident. Subsequently, Bashar was called home and rushed through a speedy military career. In Bashar's inauguration speech on July 18, 2000 he emphasised the need for repairing and reforming the poor economy, removing bureaucratic obstacles and enhancing a democracy which needed to rise from Syrian history, traditions and needs, not from western democracy. Furthermore, Bashar stressed the importance of enhanced export activities and the liberation of Golan was defined, by similar rhetoric as his late father, as the nation's top priority.[15]

Many who desired a change in the Syrian society were encouraged by Bashar's inauguration speech. Upsurges of civil society movements in Syria started in Damascus in July 2000 and six months later hundreds of civil society forums were active throughout Syria. In late January 2001, two initiatives to create unauthorised political parties surfaced which proved to be the final drop for the regime. February 2001 brought the beginning of an intensive campaign by the government to confront the movement, which would culminate later in the year with the arrest of leading civil society activists throughout the country. With the crack-down on the civil society movement, Bashar officially announced his position to give priority to economical reforms over political reforms. In late February, virtually all Syria's civil society forums had closed and leading activists were subject to harassment and imprisonment bringing an abrupt end to the "Damascus Spring".[16]

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[13] Zisser E. *Asad's Legacy: Syria in Transition*, pp. 67-69.

[14] For details regarding the Israeli-Syrian track of the peace process, see Rabil R. G. Embattled Neighbors: Syria Israel and Lebanon, pp 199-220; and Zisser E. *Asad's Legacy: Syria in Transition*, (Hurst: London, 2001) pp. 99-123.

[15] Syrian Ministry of Information, 'President Bashar Hafiz Asad's Inauguration speech', URL<www.moi-syria.com>

[16] George A. *Syria: Neither Bread nor Freedom*, (Zed Books Ltd, 2003), pp. 30-52.

In February 2001, the right wing Likud party gained to power in Israel and the new government under Ariel Sharon embarked on a more aggressive policy against Syria. This became more evident after the September 11, 2001 terror attacks against the U.S. and the following war on terrorism, which came to divert the U.S. focus from the increasing violence in the Middle East.

Syria was quick to unconditionally condemn the 9/11-attacks, and to offer the U.S. assistance in its effort to identify and capture the perpetrators, and thus turned out to become a valuable partner in the U.S.-led war against terrorism. The secular Alawi minority regime in Damascus has had its own violent struggle against Islamic militant organisations in the late 1970s and early 1980s, and is deeply hostile to Islamic fundamentalism. Furthermore, the cooperation with the U.S. constituted a tool for Syria to enhance its relations with the U.S. and the West, in an effort to counter some of the hawks in the Bush administration calling for increased pressure on the Syrian regime.

The United States Congress does not value Syria's assistance in apprehending al-Qaeda terrorists as much as the White House and has, since 2002, pushed for amendments to a bill called the Syria Accountability Act.[17] The bill calls for far-reaching economic and diplomatic sanctions against Syria unless; it withdraws all troops and security personnel from Lebanese territory, halts all support to U.S.-labelled terrorist organisations, cease the development and deployment of weapons of mass destruction and ballistic missiles, and halt all illegal transhipments of Iraqi oil. The Bush administration rejected the bill and remained on fairly friendly relations with Syria. The U.S. policy towards Syria changed dramatically in March 2003, during the invasion of Iraq, when the U.S. Secretary of Defence Donald Rumsfeld accused Syria of transferring weapons to Iraq and that the U.S. would consider such transfers a hostile act if it was to continue. On April 14, Bush accused Syria of possessing chemical weapons and harbouring Saddam regime officials, and two weeks later, the U.S. Secretary of State Colin Powell arrived in Damascus in an effort to pressure Bashar to end Syria's support to terrorist organisations.[18]

On December 12, 2003, President Bush went a step further when marking his administration's displeasure with the Syrian regime's lack of adherence to U.S. demands by signing the Syria Accountability Act. However, Bush declared that the bill was not binding, but constituted a tool "intended to strengthen the ability of the U.S. to conduct an effective foreign policy".[19]

4.4. Syrian struggle for international sympathy

Syrian president Bashar al-Asad has been more frequently exposed in western media after the U.S.-led coalition's invasion of Iraq in an effort to counter the

[17] Reported in House, 12 April 2002. URL<http://thomas.loc.gov/cgi-bin/query/C?c108:./temp/~c108JJ6YdD>

[18] 'Syria, U.S. exchange charges on weapons, Syria denies allegations', CNN, 14 April 2003, URL <http://edition.cnn.com/2003/WORLD/meast/04/13/sprj.irq.bush.syria/>

[19] Bush G W. 'Statement by the President on H.R. 1828', The White House, 12 December 2003, URL<http://www.whitehouse.gov>

growing pressure from the U.S., and the shifting power balance in the region to the advantage of Israel following the Iraqi regime's downfall. Bashar and other regime officials have made a real effort stressing Syria's sincere commitment to renewed negotiations with Israel over the Golan through U.S. mediation.[20]

Following the Iraq war, the Israeli government under Ariel Sharon has enhanced the pressure against Syria through rhetoric and military means,[21] and responded with very little interest to the Syrian proposals of renewed peace talks. The U.S. has so far showed no intention to resume any mediation responsibilities between the two countries, since it is fully preoccupied struggling to stabilise the situation in Iraq and focusing on the upcoming U.S. presidential elections.

A serious resumption of peace talks between Syria and Israel is not possible without an active and determined U.S. mediation between the parties. Syria has throughout the whole Madrid peace process from 1991 to 2000 rebuffed secret negotiations directly with Israel, and according to president Bashar's recent statements, Syria sees no prospects for renewed negotiations for peace without the U.S. acting mediator.[22] At present, the Bush administration shows a lack of interest in the Middle East peace process in general, and the Syrian track in particular, a stance that is not likely to change during this U.S. presidential election year.

4.5. EU's Syria policy - on collision course with the U.S.

Syria is a part of the European Union (EU) initiated Barcelona process. On November 27-28,1995, the governments of 27 countries[23] adopted the Barcelona Declarations with the objectives to develop the cooperation between the countries in the Euro-Mediterranean basin. The best known aspect of the Declaration is the creation of a free trade zone by the year 2010. Hafiz al-Asad realised the necessity of being a part in the process but his major focus was security politics encompassing the Arab world, the U.S., and Israel. Thus, he never really prioritised the partnership with the EU although EU constitutes Syria's largest trading partner. Approximately 65% of Syrian export reaches EU countries, France, Germany, Italy and Spain being the largest importers.[24] In 1998, the negotiations between EU and Syria were initiated, but no real progress was made until Bashar came to power. As the only Mediterranean country in the Barcelona Process without an association agreement, Syria is currently (April

[20] Weymouth L. 'We don't call it Terrorism', *Newsweek*, 19 May, 2003; MacFarouhar. 'Syrian Pressing for Israel Talks', *New York Times*, 1 December, 2003; and 'Khaddam: Syria wants to hold peace talks', *Yahoo News*, 18 February 2004.
[21] The Israeli air force struck against alleged terrorist training camp in Ein Saheb Northwest of Damascus, Syria, on 5 October, 2003.
[22] 'Interview with Syria's President Bashar al-Asad', *New York Times*, 30 November 2003.
[23] The 27 countries are: the 15 EU countries: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, United Kingdom, and Algeria, Cyprus, Egypt, Israel, Jordan, Lebanon, Malta, Morocco, Syria, Tunisia, Turkey, and the Palestinian National Authorities.
[24] US Energy Information Administration, *Syria Country Analysis Brief*. URL<http://www.eia.doe.gov/emeu/cabs/syria.html>

2004) in the final stages to conclude the agreement with the EU, motivated by the looming isolation and increased pressure from the U.S. However, in late February 2004, the process stalled due to a dispute within the European Union Council regarding the non-proliferation article of the association agreement with Syria.[25] Great Britain, Germany and the Netherlands are advocates of a tougher wording of the article, which emanates from an EU Council declaration on non-proliferation of weapons of mass destruction adopted in Thessaloniki in June 2003.[26]

A concluded agreement with the EU would deflect much of U.S. pressure against Syria, in particular consequences of possible future U.S. sanctions through the Syria Accountability Act. On one hand, when confronted by the media regarding the Syria Accountability Act, and its possible restraints for Syrian relations with the U.S., Bashar emphasises Syria's enhanced relations with the EU through the progress towards an association agreement. Nevertheless, Bashar realises the necessity of good relations with the U.S., and its vital role in bringing peace and stability to the region. However, the Syrian president states that there can be no peace in Iraq or in the Middle East region without Syria. He thereby sends a warning to the U.S. administration that they need to cooperate with, and not isolate, the Syrian regime in order to stabilise the situation in Iraq, and to reach any improvement in the Middle East conflict.[27]

[25] Lyon A. 'EU-Syria trade deal still held up by WMD demands', *Reuters*, URL<http://uktop100.reuters.com/latest/Foreign_Office/top10/20040213-SYRIA-EUROPEp.asp>, 13 February 2003.
[26] Council of the European Union. 'Presidency Conclusions – Thessaloniki 19 and 20 June 2003', p. 31 and pp. 38-40.
[27] Interview with Syrian president Bashar al-Asad, *New York Times*, 30 November, 2003.

5. Syrian Incentives for WMD Acquisition

The value of WMD in the tactical field, as well as a component of a deterrence strategy in the Middle East region, has varied over time. This development has most certainly affected the Syrian leadership's stance regarding the possibilities and risks that the acquiring and the operating of offensive NBC-programs will bring.

The international community's reaction to allegations of WMD possession and use in the Middle East region has changed from a fairly moderate concern during the 1970s and 1980s, to the "greatest security risk of this decade," during the operation Iraqi Freedom.[28] In this chapter, an effort has been made to highlight the events perceived by this study to have been dimensional for the region regarding the Syrian incentives and disincentives for WMD possession and acquirement. These events, in the light of major policy developments of the Syrian regime, may serve as valuable components to the overall picture of feasible Syrian aspirations regarding weapons of mass destruction.

5.1. Regional Chemical Warfare experiences

The Middle East region has experienced a development of chemical warfare and a WMD arms race during the 1960s up until the 1990s, not entirely dissimilar to the European experiences between the First and Second World War, or to the NATO-Warsaw Pact arms race that started at the end of the Second World War and went on until the late 1980s.[29]

The first convincing evidence of chemical warfare in the Middle East derives from the Egyptian intervention in the Yemeni Civil War (1963-1967).[30] Allegations range from the use of tear gas to the occasional use of nerve agents, although the evidence for the latter is very weak. According to existing reports, mustard gas-filled aerial bombs were probably used at the end of the war.[31]

Although the Egyptian alleged use of chemical warfare in Yemen does seem to have attracted some media attention at the time, including rare statements by the International Committee of the Red Cross, and a Saudi Arabian report that was circulated in the United Nations (UN) Security Council, the case was never

[28] Sample D. 'WMD in Wrong Hands is "Greatest Security Risk" This Decade, Wolfowitz Says', US Department of Defence, American Forces Press Service, May 2003, URL<http://www.defenselink.mil/news/May2003/n05162003_200305162.html>

[29] For details regarding the European WMD arms race and chemical warfare experiences see "FOI briefing book on Chemical Weapons- threat, effects and protection", No. 2, November 2002, pp. 4-9.

[30] SIPRI, *The Problem of Chemical and Biological Warfare, Volume 1: The Rise of CB Weapons* (Almqvist & Wiksell: Stockholm, 1971), pp. 159-161, 336-341 and SIPRI, *The Problem of Chemical and Biological Warfare, Volume V: The Prevention of CBW* (Almqvist & Wiksell: Stockholm, 1971), pp. 225-238.

[31] Ibid.

brought up in the UN.[32] The somewhat mild international reactions might have spurred Egypt to further develop their chemical capacity and also indicated to other states seeking an unconventional capacity that there was no, or little, retaliation from the international community associated with the development and use of chemical warfare.

A few years after the Egyptian involvement in Yemen, Egypt and Syria were allied and military coordinated through the 1967 and 1973 Arab-Israeli wars. There are allegations that Syria received chemical weapons (CW) artillery shells from Egypt prior to the 1973 October War, but no reports of chemical warfare during the war are to be found.[33] The non-use of chemical weapons might be explained by the fact that the Syrian objectives prior to the war were of a limited nature, and that Syria never intended to strike at the heartland of Israel but only to regain the occupied Golan Heights in due time for UN to implement a cease fire agreement.[34] Furthermore, there are several other factors, such as the chain of command, training, and physical and medical protection, than the actual physical access to chemical weapons that has to be fulfilled before an aggressor can successfully use this type of weapons.

Despite the initial success of the Arab offensive against the Israeli positions on the occupied territories, the October War ended with an Israeli advancement into Syrian territory and a strategic bombing campaign against Syrian infrastructure throughout the country. The war highlighted several deficits in Syria's military capabilities and above all, the Syrian regime realised that it needed to enhance its deterrence capabilities.[35] During a visit to Damascus in March 1974, Soviet Foreign Minister Gromyko made a reference to Syria's legitimate, inalienable right to use all effective means to liberate its occupied land. Two months later, the two countries signed several bilateral agreements in various fields including a large-scale arms deal providing Scud-B surface-to-surface missile systems to Syria. Within less than a year after the 1973 War, Syria had received military material from Soviet Union worth some US$ 2 billion.[36]

Contrary to the earlier alleged use of CW by Egypt in Yemen, the massive Iraqi CW-use during the Iran-Iraq War 1980-1988 was verified by UN investigation missions, and their findings resulted in several UN resolutions condemning the use of CW in the war.[37]

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[32] Some parts of the Saudi Arabian report are cited in: SIPRI, *The Problem of Chemical and Biological Warfare, Volume V: The Prevention of CBW* (Almqvist & Wiksell: Stockholm, 1971), pp. 229.
[33] Regarding Egyptian CW artillery shells supplied to Syria see 6.2.3 in this report.
[34] Dunstan S. *The Yom Kippur War 1973 (1)*, (Osprey Publishing Ltd: Oxford, 2003), p. 7.
[35] Eisenstadt M. 'Arming for peace? Syria's elusive quest for "Strategic Parity"', *Washington Institute Policy Papers*, No 31, 1992, pp. 16-18.
[36] Karsh E. *Soviet policy towards Syria since 1970*, (Macmillan, 1991), pp. 83-84 and p. 88.
[37] UN Security Council Resolution 582, February 1986, Resolution 598, July 1987 and Resolution 612, May 1988.

Despite the confirmed use of chemical weapons, Saddam Hussein did come out from the war without being punished for violating the 1925 Geneva Protocol. The international community's inability to take serious actions against Iraq and Saddam Hussein, was a demonstration of the limitations that comes with arms control regimes that do not contain a response mechanism to non-compliance. Furthermore, the lack of effective countermeasures against Iraq for the use of chemical weapons clearly indicated to other states, seeking a non-conventional capacity, that there were few, if any, penalties associated with development, and even use, of CW. It is also reasonable to speculate, whether the lack of response from the international community somewhat strengthened Saddam Hussein in his attempts to cement his roll as a regional leader in the Arab World.

The initial use of chemical weapons in the Iran-Iraq War was probably quite ineffective due to lack of experience using this form of warfare. However, as from 1983-84, the Iraqis had become more effective in using CW, and was now an integral part of the counter offensive strategy. Chemical agents were employed to some extent as artillery and mortars but the preferred use was deployment from airborne platforms in the form of chemical bombs or from spray tanks. The psychological and terror effects of non-conventional weapons were dramatically demonstrated in the so-called "War of the Cities" in early 1988. Both Iran and Iraq targeted civilian population centres with ballistic missiles and Iraq is said to have fired some 190 missiles at Iranian cities. The threat from chemical loaded missiles is cited as one reason for Iran to later accept the peace agreement.

The Syria-U.S.S.R. relationship reached its prime during Soviet President Andropov's period between 1982 and 1984. His successor, Chernenko, then advised restraints in the Soviet policy towards Syria, a policy which became further predominant after Gorbachev came to power in Moscow in March 1985. Gorbachev emphasised the political option as a means to resolve the Arab-Israeli security dilemma and broadened the Soviet base of influence in the region through the conservative Arab states such as Qatar, Oman and the United Arab Emirates. Gorbachev thereby strived to counter weigh American influence in the emerging political process in the region following the Israeli-Syrian conflict in Lebanon. Consequently, Syria's status as the main Arab ally to Soviet began to erode and thereby the vital foundation for Syria's struggle towards strategic parity with Israel rapidly diminished.[38]

The absence of Soviet military and financial support, in combination with a severe economic decline in Syria as from the early 1980s, which intensified rapidly during 1985 and 1986 forcing the regime to make cutbacks in the military expenditures, made the Syrian quest for a strategic parity with Israel an illusion impossible to obtain, if ever a realistic one. The value of strategic deterrence policy thereby came to be of further importance, likely to augment the Syrian quest for acquiring a WMD capability.

[38] Karsh E. *Soviet policy towards Syria since 1970*, (Macmillan, 1991) pp. 163-177.

5.2. Incentives turn disincentives

After a period of enhanced awareness of the Middle East regimes' possible WMD ambitions during the late 1980s, the Iraqi invasion of Kuwait in September 1990 nevertheless became a wake up-call regarding the aggressiveness of the Saddam regime and lack of respect for international rights and norms. This, in combination with the aftermath of the following Gulf War when the Iraqi regime's obsessive hype for weapons of mass destruction was disclosed, added to the international community's growing concern regarding the threat from dictatorial regimes having WMD ambitions.

Iraq serving as a new role model for a typical "Rogue State",[39] and the concern for the WMD legacy following the breakdown of the U.S.S.R. in 1991, the international struggle to counter proliferation and the increasing WMD threat were given a higher priority. The multilateral efforts to counter the spread of WMD through the export control regimes started to render its activities more effective and gained a broader support for its policies of export control. Nuclear Suppliers' Group (NSG) began to focus its export control on dual-use items in 1992. At the same time, Australia Group (AG) implemented export control of biological pathogens and BW-related equipment as complementary to the existing CW core list. In early 1993, the Missile Technology Control Regime (MTCR) extended the scope of the regime to missiles capable of delivering biological and chemical weapons as well as nuclear weapons.[40] In addition, the CWC was opened for signature in January 1993 and in the same year, the International Atomic Energy Agency (IAEA) initiated its 93+2 program to strengthen its Safeguards regime; a work that developed into INFCIRC/540, better known as the Additional Protocol.

The effect that the tighter and more far-reaching export control policies had on Syria is difficult to evaluate, but advanced Western technology within biological-, nuclear- and chemical industry became, to a large extent, out of reach for countries like Syria, Iran, Iraq, Libya and North Korea. Furthermore, the activities of the multilateral export control regimes are essentially dependent on information-sharing and exchange of experiences regarding proliferation concerns and threats, further enhancing and streamlining the view of "rogue regimes" as the prime focus for the export control activities. As from the early 1990s, the western countries thereby came to effectively consolidate their views regarding which states constituted a present and future WMD concern.

The terrorist attacks on September 11, 2001, and the following dispersal of five anthrax-contaminated letters in the U.S., highlighted the frightening scope of the

[39] **"Rogue" states:** Countries regarded as hostile to the United States and its allies and suspected of developing or deploying WMD. Though the U.S. State Department discourages use of this term, it is still used by some U.S. officials in reference to North Korea, Libya, Syria, Iran and Iraq. States of concern has replaced the term "rogue" states.

[40] For information regarding the Export control regimes see Federation of American Scientist (FAS) web site, URL<http://www.fas.org.>

terrorist organisations' capabilities and lack of limitations regarding methods and targets. With this new insight, the struggle against terrorism and WMD became a top priority in U.S. defence and foreign policy. A new U.S. defence policy gained momentum through the lobbying of the neoconservatives within the Pentagon. The new strategy aims at taking the fight directly to the terrorists, and it declares that the United States will make no distinction between the terrorists and the states harbouring them. When it comes to Syria, with its impressive and long-term track record regarding the sponsoring of terrorism and the acquiring of WMD, the consequences, in the wake of the changed U.S. policy, are bound to escalate with economic sanctions and continued political pressure.

Following the U.S. hard-line defence policy, the Syrian regime made efforts to counter the pressure by cooperating with the U.S. in the apprehending of al-Qaeda suspects and by sharing information regarding terrorist activities. This cooperation prevented planned terror attacks against U.S. targets. Nevertheless, the Syrian efforts have been far from sufficient in order to avoid U.S. demands, at best buying the regime some time. The U.S. started turning against the Syrian regime in early 2002, probably as a reaction to the Syrian breach of the United Nations sanctions against Iraq. With the military ousting of the Taliban regime in Afghanistan and Saddam Hussein's regime in Baghdad, the U.S. administration has, since spring 2003, increased the pressure against Syria for its alleged support to terror organisations and possession of WMD; pressure still not implemented through other means than rhetoric. Economic sanctions are predicted to be implemented during 2004 by way of the U.S. Syria Accountability Act.[41]

What seemed to be an effective strategic tool having a far-reaching potential for the Syrian regime in the early 1980s, and with a limited scope of political implications, has transformed into an increasing political and economical burden today. The threat constituted by proliferation and possession of WMD are recognised as of mutual concern worldwide. This, in connection to state actors' ever-widening dependence on the global economy and trade market, make it extremely difficult to pursue an offensive capability, should it become internationally assessed, without taking the political and economical heat from the label that pursuing WMD implies. This is the hard reality, especially for a poorly industrialised country like Syria, apparently trying to achieve better relations with the Western world after over 30 years of isolation, and having an ambition to boost its scarce economy and to counter its even tougher security policy environment.

5.3. WMD in Syrian Deterrence Strategy

Although the Syrian Government has always denied possession of weapons of mass destruction, the Syrian regime has, on a few occasions since the 1990s,

[41] Labott E.'U.S. to hit Syria with sanctions', *CNN*, Washington Bureau, 10 March, 2004.

made statements, implying the existence of Syrian weapons of mass destruction capabilities and, highlights a Syrian deterrence strategy.

After the Libyan leader Muammar Qaddafi's announcement to dismantle the Libyan weapons of mass destruction programs in December 2003, the United States and the United Kingdom were quick to use the Libyan case as leverage in order to increase pressure on Damascus to follow the Libyan example. The Syrian president rejected the call in an interview with the British newspaper the Daily Telegraph on January 6. In the article, he stated that "Syria is entitled to defend itself by acquiring a chemical and biological deterrent" and that "it is not difficult to get most of these weapons anywhere in the world and they can be obtained at any time".[42] Furthermore, he acknowledged the Libyan decision to dismantle the WMD-programs under international supervision as a correct step, and in December 2003 called on the international community to support Syria's draft resolution in the UN Security Council regarding a WMD-free zone in the Middle East.

The draft resolution, calling for a Middle East region free of all weapons of mass destruction, especially nuclear ones, was presented by Syria on April 16, 2003.[43] The draft, which was backed up by the 22-nation Arab Group, came during a time of increasing U.S. pressure, and only two days after George W. Bush had accused Syria of possessing chemical weapons, and to harbour Saddam regime officials. The Syrian regime was thus trying to alleviate the increasing pressure by putting some of the focus on Israel and its alleged arsenal of nuclear weapons. The resolution was met with doubts by the U.S. and the other Security Council members at a time when the ongoing mission to disclose the expected arsenal of WMD in Iraq was of primary concern. Shortly before leaving the Security Council, on December 29, 2003, Syria once more called for a discussion of the draft resolution in the Security Council. The UN Security Council met and discussed the draft resolution on December 30, 2003, but refrained from public statements regarding the meeting.[44] For further details regarding multilateral disarmament ambitions amongst the Arab States, see Appendix 3.

A unique reference to biological weapons was made by a Syrian government official in an article written by the spectacular Syrian Minister of Defence, Mustafa Tlas, in late 1999.[45] In the article, titled "Biological Warfare, A new and Effective Method in Modern Warfare", Tlas highlighted different types of biological agents, ways of dispersal, BW defence and important aspects to consider regarding offensive use of biological weapons against an adversary.[46] The article was published in the conservative politico-military publication SAFF, administrated by

[42] Benedict Brogan, 'We won't scrap WMD stockpile unless Israel does, says Asad', *Daily Telegraph*, 6 January, 2003.
[43] 'Syria proposes Mideast free of WMD', *CNN*. 17 April 2003.
[44] Arieff I. 'UN Council to weigh nuclear arms ban in Middle East', *Reuters*, 26 December 2003.
[45] Mustafa Tlas is perceived as a political bully who on several occasions has made extraordinary statements in the past, conceivably with president Hafiz Al Asad's silent permission.
[46] Saff, 22 November – 27 December 1999, pp. 38-42 (Persian). FBIS Translated Text IAP20000501000119.

the Ideological Bureau of the Armed Forces of the Islamic Republic of Iran. The article is poorly written with a number of faults regarding technical aspects. Thus, the article seems to serve a political purpose rather than a scientific one.

Using an Iranian officer periodical is an effective way of spreading the message to intelligence services worldwide, and thereby further enhancing a perceived WMD deterrence strategy.

The most explicit official statement referring to Syrian possession of chemical weapons was reportedly made by the acting Syrian ambassador to Egypt at the time, Issa Darwish, in November 1996 shortly after Benjamin Netanyahu was elected Israeli Prime Minister and the peace process had stalled. The Israeli Minister of Defence, Yitzhak Mordechai, made a statement in which he warned Syria of threatening Israel with weapons of mass destruction as Israel would defend itself and harm the other side with an exceptional military ability. As a reply to the statement, ambassador Darwish was quoted in the weekly newspaper Al-Ahram stating that Syria was now preparing to face up to any Israeli threat and that Syria would respond by using chemical weapons. The next day, Darwish made a new statement in which he denied any Arab state possessing weapons of mass destruction and that all Arab states had adhered to the Nuclear Non-Proliferation Treaty (NPT) while Israel refused to do so. Thereby he implied that Israel constitutes a threat to peace and security in the region and Europe by its possession of nuclear weapons.[47] Mr Darwish was Syria's ambassador to Egypt from 1989 to 1999 and later became Syria's deputy foreign minister.

Other official statements, interpreted as being parts of Syria's deterrence strategy, have been made by President Hafiz al-Asad. In a speech made in June 1990, Asad stated that the Arabs could, with what they had, inflict the same disasters on Israel as Israel is capable of inflicting on the Arab states in case of war. In this statement, the word "disaster" may be interpreted as a reference to the Israeli nuclear capability, thus constituting a warning claiming that the Arab states also had WMD capability.

Israeli officials often accuse Syria of producing chemical weapons and missiles with CW warheads. On May 1, 1997, President Asad replied to such an allegation made by the Israeli Minister of Defence Mordechai and the Foreign Minister Levy, by saying: "Those who have nuclear weapons do not have the right to criticise others regarding any weapons which they possess. If they want disarmament, we should start with nuclear ones. We, the Arabs, are ready to get rid of other weapons".[48]

[47] The Acronym Institute for Disarmament Diplomacy, Issue No. 11, December 1999 and Zuhair D, 'Syria's Chemical and Biological Weapons: Assessing Capabilities and Motivations', *The Nonproliferation Review*/Fall 1997.
[48] Zuhair, D. 'Syria's Chemical and Biological Weapons', *The Nonproliferation Review*/ Fall 1997.

The present Syrian security policy context following the war in Iraq and the Libyan denouncement of weapons of mass destruction**,** has forced the Syrian regime to enhance its strategy to counter the international allegations of WMD ambitions and possession. The strategy, evident from Bashar's recent statements, is to justify possession of any weapons. The argument is that the country is at war against a State Party (i.e. Israel), generally considered to possess a large nuclear arsenal. Furthermore, Damascus tries to deflect international demands of Syrian renouncement of WMD capacity, and adherence to international conventions towards Israel, through calling for the creation of a WMD-free zone in the Middle East region.

6. Capabilities and Ambitions

6.1. Capabilities

6.1.1 Research and Development

In general, the educational level of the Syrian population seems to be relatively low. According to official Syrian statistics for the year of 2001, the four Syrian universities harboured 333 doctorate students and 1,793 master students.[49] In recent years, however, one governmental education strategy has been to finance several hundred university grants for studies abroad making available the western educational market for gifted Syrian students. The relation between industry and research seems generally weak and the coordination between the demands of the local industry and the availability of foreign trained academics could probably be improved.[50] The availability of a broad scientific research base is however not a mandatory part of the pathway leading to a successful domestic WMD-program. A well-defined and specialised training program abroad for a few chosen students, along with the cooperation of foreign experts, is probably an important part of the Syrian chemical weapons program.

Syria is also setting up international collaborations. One important project, described in detail in Appendix 2, is the collaboration with India. Several of the technology transfers within the field of microbiology/molecular biology and chemistry, especially plant design, will increase knowledge that can be of use in potential future BW/CW programs.

Another indicator of the weak Syrian research and development (R&D) sector is the extremely low Syrian representation in international scientific research publications databases. A survey of the major scientific databases from the 1960s to 2003 only produced approximately 280 “hits” for Syria compared to much higher numbers for Jordan (8 000), Egypt (60 000) and Israel (100 000), using relevant search criteria. For a detailed description of this survey, see Appendix 2.

Syria harbours some research institutes, of which some have surfaced as alleged entities of concern related to WMD development. The main contributor of military R&D in Syria is the Scientific Studies and Research Centre (SSRC), established in 1969, and it has repeatedly been accused for procurement and research

[49] Syrian Central Bureau of Statistics, *Syrian Statistical Abstract 2002*, ISSN 0256-7768.
[50] Alwan, M. and Obeid, N. E. C., Collaboration between Educational and Research Institutes and Industry in Developing Countries: Experience of Syria and HIAST.2000. Conference proceedings from the conference on Scientific Research Outlook in the Arab World in the New Millennium, Sharjah, April 2000, URL <http://nmit.georgetown.edu/papers/alwanobeid.htm>

contributions in the field of chemical and biological weapons.[51] The centre's official profile, though, is to work for the development and coordination of research in Syria. [52]

The Higher Institute of Applied Sciences and Technology (HIAST) is an engineering institute, which is aimed at bridging the gap between higher education and the industry.[53] HIAST is sometimes alleged doing military-associated research.

Another research institute that could be involved in research connected to chemical and biological agents, possibly protective research, is the Environmental and Scientific Research Centre (ESRC) in Damascus. The institute is, to our knowledge, not mentioned in the open literature as an entity of concern but can be connected to the alleged Russian proliferator General Kuntsevich. See Appendix 2 for a detailed discussion of this connection.

Nearly all Syrian nuclear related research seems to be conducted under the Atomic Energy Commission of Syria (AECS). There are two nuclear facilities of some prominence; a small 30-kW research reactor of Chinese origin and a cyclotron facility. Both were built during the 1990s. The IAEA has been instrumental in the Syrian nuclear development and since 1974, Syria has gained direct technical assistance in 58 national IAEA projects.

6.1.2. Industry

The Syrian pharmaceutical industry has expanded surprisingly rapid during the last two decades and is today able to provide 85-100% of the domestic need for pharmaceutical products. The production sector seems to be highly privatised and only one out of 54 identified producers is state owned.[54] Syria currently exports pharmaceutical products to 31 countries[55] and has also received licenses from several western companies to produce and market their products in the region.[56] The fairly well developed pharmaceutical industry has the potential to harbour a production capability for biological weapons agents. It should however be emphasised that the authors of this study have not detected any signs of a Syrian biological agent production for illegitimate purposes. It can also be stressed that nearly all pharmaceutical producers are privately owned and that some of them have collaborations with western companies, making clandestine activities vulnerable to detection.

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[51] Nuclear Threat Initiative, Syrian profile, Biological Facilities, URL <http://www.nti.org/e_research/profiles/Syria/Biological/3342_3348.html>

[52] Scientific Studies and Research Centre of the Syrian Arabic Republic, URL <http://www.ifip.or.at/members/syria.htm>

[53] HIAST, URL <http://www.comsats.org.pk/hiast/hiasthome.html>

[54] The Syria Report, 9 March, 2002.

[55] The Syria Report, 26 July, 2002.

[56] ALPHA, Aleppo Pharmaceutical Industries, Syria, URL <http://www.alpha-syria.com/company.html>, Oubari & Co, Syria, URL <http://www.oubari.com/new/company.html>

The chemical industry seems to be less developed, but Syria is actively working on refining its natural assets.[57] The oil industry is the major Syrian industry sector and there are at least two refineries present in the country. In addition, Syria is a producer of fertilisers and sulphur. Some production plants for industrial bulk chemicals have been taken into operation in recent years, often in cooperation with foreign counterparts. It should be noted that Syria probably could manage to provide the raw material for most chemical warfare agents. However, it is uncertain whether Syria is able to master all production steps of the more advanced nerve agents. Therefore, Syria might still be dependent on import of some precursors.

6.2. WMD ambitions

6.2.1. Nuclear Ambition

There was a long delay between the time Syria sought membership in the IAEA (in 1963) and the formation of the Syrian Atomic Energy Commission in 1979. In comparison, neighbouring Iraq formed its Atomic Energy Commission as early as in 1956 and joined the IAEA in 1959. However, parallels can be drawn to the Syrian timeframe in Iran, which joined the IAEA in 1958, but did not establish its Atomic Energy Organisation until 1975 when the construction of the Bushehr reactor started.

In retrospect, it is evident that nuclear development in the region reached a peak in the mid-70s when Iran succeeded in buying the Bushehr nuclear power reactor from Germany and Iraq acquired the Osiraq reactor from France. Both reactors turned out to be ill-fated as Siemens withdrew from the Bushehr project after the Iranian revolution in 1979 and Osiraq never went critical after the Israeli bombings in 1981.

Of course, Syria was also at the time seeking to jump on the nuclear bandwagon. The article written by the Syrian Minister of Electricity in 1982 illuminates how Syria perceived its nuclear future;[58] it realised it did not have the economy to establish its own nuclear fuel cycle, but was instead prepared to work for the establishment of a pan-Arabic nuclear fuel cycle. In 1979, Syria also received the help of the IAEA to begin a project on nuclear energy planning, which was to last until 1986. Before 1979, the Syrian IAEA projects only had dealt with different aspects of the use of radioactive isotopes in agricultural and hydrological applications.

It would be naïve not to believe that Syria at this point was not interested in enhancing its deterrence capability by acquiring nuclear weapons. It could be argued that Syria had ratified the NPT, but as history has revealed on several

[57] See also Appendix 2.
[58] Youssef, A.O., Co-operation is the key to Arab nuclear development, *Nuclear Engineering International* 27:322, 13-14 (1982).

occasions, it is possible to pursue nuclear weapons ambitions despite treaty declarations.

The eagerness with which Syria signed the NPT in 1969 as only the second state in the world probably reveals a desire to deal a blow to Israel.[59] The Israeli possession of nuclear weapons, or at least strong suspicions that they could have built nuclear weapons, was well-known in the Arabic intelligence community in the late 60s. The general opinion is that Israel had its first two nuclear weapons finished by the time the Six-Day War started in 1967. When the impotence of the NPT to deal with non-signatories later was revealed, Syria changed its tactics and has ever since been reluctant to sign most international WMD treaties.

The nuclear reality of the region must have dawned on Syria already in the second half of the 80s; it is extremely difficult to close reactor deals without the approval of the U.S., and thus indirectly the State of Israel. When Syria finally got its nuclear reactor, they got it as a sort of reward for good behaviour during the Gulf War. However, the Chinese-built research reactor was the smallest on the world market and incapable of military applications.[60]

The new world order after the end of the Cold War also means that Russia as the most likely reactor supplier to Syria is extremely cautious to close a deal that would upset the U.S.. In January 2003, this reached an almost farce-like situation when a Russian Foreign Ministry spokesman stated that Russia and Syria had concluded a deal during the visit to Moscow of the Syrian Vice President Abd Al-Halim Khaddam.[61] The next day, Nicolai Shingrab, a senior adviser at Minatom declared that no deal existed as Syria could not afford to pay the US$ 1 billion price-tag.[62]

After many setbacks, current Syrian nuclear reactor ambitions seem to be very low. The Syrian economy is not strong enough for an ambitious nuclear reactor project and there is no foreign desire, given the U.S. stance, to help Syria to finance such a project. One must assume that Syria today has diverted resources previously going into different nuclear reactor projects, possibly having been linked to covert nuclear weapons ambitions, to uncontroversial civil applications. Research around the cyclotron (for details, see Appendix 4) seems to advance well and in many other cases, the ambitious nuclear intentions in the early 80s now seem to bear fruit in civil research areas. It should be noted that the IAEA

[59] UN CD, Press Release DC/2698, NPT 'Not the Ideal non-Discriminatory Document Hoped For', Syria Asserts as Review Conference Continues, 26 April, 2000.
[60] Böck, H., Villa, M., Survey of research reactors, (MNSR). URL<http://www.reak.bme.hu/nti/Education/Wigner_Course/Wignermanuals/Bratislava/Research_Reactors_I.htm >
[61] Anonymous (Menareport.com), Russia to build Syria's nuclear reactor, 15 January, 2003. (Accessed at: URL<http://www.intellnet.org/news/2003/01/15/15338-1.html>, 13 February, 2004).
[62] Anonymous, Middle East Newsline, 24 hours after agreement, Russia backs off on Syrian nuke plant, 16 January, 2003. (Accessed at: World Tribune.com URL<http://216.26.163.62/2003/eu_russia_01_16.html>, 13 February, 2004).

has played a pivotal role to help stage peaceful applications. In return, Syria, despite its poor economy, has punctually paid its share to the IAEA.

It is interesting to note that the untangling of Abdul Qadeer Khan's nuclear weapons supplying service, which he ran from Pakistan, has not been able to reveal any links to Syria. By now, it is well established that Iran, Libya, and North Korea obtained assistance from Khan and his associates. A note that turned up during the IAEA investigation of Iraq in the mid-90s suggests that Iraq in 1990 also received an offer in which the Khan network offered their assistance, but ironically chose not to believe the offer was genuine. All stones in the ongoing Khan investigation may not yet have been turned, but currently it looks like Syria never was directly involved.

In conclusion, although suspicions have existed since at least the early 1980s that Syria has been seeking nuclear weapons, no Syrian nuclear weapons program has been identified. The complete dominance of the AECS in the nuclear field in Syria does not help Syrian efforts to shake off these suspicions. One example is the recent construction of a pilot plant for the legitimate removal of uranium and other hazardous substances from phosphoric acid for food industrial applications. The leading role of the AECS in this project proves disadvantageous to Syria as Western export control regimes will focus their interest on the potential recovery of uranium and try to tie this to possibly covert plans of the AECS. Syria should realise that if a project is intended to serve its food industry, it should be run by the General Organisation for Food Industry, not the AECS.

The involvement of the AECS in this project stems back to the early 80s, when it initiated a project with IAEA assistance to recover uranium from phosphoric acid. The project was approved in 1986.[63] A second project on the topic was initiated in 1996.[64] The project names suggest that during the decade, the main content tilted from uranium recovery to purification of the acid. If the Syrian interest in acquiring the technique indeed also changed during this time period, or if political reasons could be found behind the changed focus of the two projects because of the hardened stance of the IAEA on non-proliferation after the Gulf War, is not possible to deduce from the sparse reporting that we have been able to trace.

6.2.2. Biological Ambition

From time to time, there are allegations that Syria has an offensive BW program. In November 2001, during the 5th Review Conference for the Biological and Toxin Weapons Convention (BTWC), John R Bolton, U.S. State Department Under Secretary for Arms Control, stated that "Syria has an offensive BW program in the R&D stage and it may be capable of producing small quantities of agents". In the CIA unclassified Report to Congress, 2003, it is stated that "it is highly

[63] Uranium Recovery from Phosphoric Acid, IAEA Technical Co-Operation Project SYR/3/003 (1986).
[64] Purification of Phosphoric Acid, IAEA Technical Co-Operation Project SYR/3/005 (1996).

probable that Syria (also) continued to develop an offensive BW capability".[65] This statement echoes for instance the Annual reports to Congress (1995-1997) by the U.S. Arms Control and Disarmament Agency, in which they state "The United States reaffirms its previous judgment that it is highly probable that Syria is developing an offensive BW capability".[66]

These reports along with a few others by Cordesman,[67] Hashim,[68] Eisenstadt[69] and the Office of the Secretary of Defense[70] try to paint a similar picture by citing each other and more or less unanimously saying:

- Syria has signed but not ratified the BTWC.
- It is highly probable that Syria continues to develop an offensive BW capability including:
  - Extensive research efforts.
  - Probable production capability for anthrax and botulism, and possibly other agents.
- Syria's biotechnical infrastructure is capable of supporting limited agent development.
- Syria is not believed to have begun any major effort to put biological agents into weapons.
- Without significant foreign assistance, it is unlikely that Syria could manufacture significant amounts of biological weapons for several years.

The last three bullet points are quite reasonable to agree upon. The research efforts have not been verified in our study. Although realising that R&D aiming at making biological weapons is not published in open literature, there are no indications that Syria has the scientific level and infrastructure needed for establishing an offensive BW program. Thus, also attempts to identify certain agents that might be of interest for a potential offensive BW program must be questioned. References cited on this subject are "Israeli sources",[71] German and

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[65] Central Intelligence Agency, *Unclassified Report to Congress on the Acquisition of Technology Relating to Weapons of Mass Destruction and Advanced Conventional Munitions, 1 January Through 30 June 2003.* URL <http://www.cia.gov/cia/reports/721_reports/jan_jun2003.htm#7>

[66] US Arms Control and Disarmament Agency, *Annual reports to Congress. VII. Adherence To and Compliance with Arms Control Agreements 1997,*
URL <http://dosfan.lib.uic.edu/acda/reports/annual/chpt7.htm.>,
URL <http://dosfan.lib.uic.edu/acda/reports/complian.htm>

[67] Cordesman, A. H., Weapons of Mass Destruction in the Middle East, 1999, Center for Strategic and International Studies, URL<http://www.csis.org/mideast/reports/WMDinMETrends.pdf.>, Cordesman, A. H. and Burke, A. A., If it is Syria: Syrian Military Forces and Capabilities, 2003,Center for Strategic and International Studies, URL <http://www.mafhoum.com/press5/142P3.pdf>

[68] Hashim, A. S. 1998. The Deterrence Series. Chemical and Biological Weapons and Deterrence Case study 1: Syria. p.10. Chemical and Biological Arms Control Institute, Alexandria, Va, USA.

[69] Eisenstadt, M., Syria's strategic weapons. Jane's Intelligence Review. April 1993, pp. 168 -169.

[70] Office of the Secretary of Defence, January 2001, Proliferation threat and response,
URL <http://www.defenselink.mil/pubs/ptr20010110.pdf>

[71] Cordesman, A. H., Weapons of Mass Destruction in the Middle East, 1999, Center for Strategic and International Studies, URL<http://www.csis.org/mideast/reports/WMDinMETrends.pdf.>, Cordesman, A.

Israeli intelligence sources,[72] or an article by Richard M. Bennett in the *Middle East Intelligence Bulletin* where he without any further reference mentions anthrax, botulinum toxin and cholera as part of a Syrian BW program.[73] The problem of establishing an objective picture of Syrian BW ambitions can be further exemplified by reading the statement made by U.S. Congress woman Ileana Ros-Lehtinen,[74] at a hearing regarding "Syria: Implications for U.S. Security and Regional Stability on September 16, 2003,[75] where a number of her conclusions are citations word-by-word of an article by Dany Shoham, a research associate at the Begin-Sadat Center for Strategic Studies, Bar-Ilan University. The hawkish article by Dr. Shoham should not, to our understanding, be taken as an obvious stickler for the truth in this subject (for more details, see Appendix 1)

Thus, our conclusion is that Syria does not have an offensive BW program today. If there is any BW defense research being conducted today, no such indications can be found in open sources. However, considering the dual-use capability of pharmaceutical facilities, it could be stated that Syria, through its expansion within the pharmaceutical industry and the investment on biotechnology, is building a capacity that can be used in a potential future offensive BW program.

6.2.3. Chemical Ambition

Compared to many other "countries of concern", when discussing chemical weapons, Syria has managed to somewhat stay out of focus in the open source sphere of information. Some public information is however available that can be used to give at least a brief overview of the alleged Syrian chemical weapons program.

Syria acceded the 1925 Geneva Protocol in 1968 and did not reserve right of retaliation. The country is not a state party, or signatory state, to the CWC.[76] As further discussed in Appendix 3, this position, which is shared with Egypt and Lebanon, has to be viewed in the context of the perceived non-conventional threat from Israel. Israel has signed but not ratified CWC and both Iran and Jordan are state parties to the convention.

H. and Burke, A. A., If it is Syria: Syrian Military Forces and Capabilities, 2003, Center for Strategic and International Studies, URL <http://www.mafhoum.com/press5/142P3.pdf>

[72] Jane's Intelligence Digest, May 2, 2003, Syria's Secret Weapons, URL <http://www.janes.com>

[73] Bennett, R. M., The Syrian Military: A Primer, Middle East Intelligence Bulletin, August/September 2001, URL <http://www.meib.org/articles/0108_s1.htm>

[74] Hon. Ileana Ros-Lehtinen is Chair of the Subcommittee on the Middle East and Central Asia, Committee on International Relations, in the US House of Representatives.

[75] U.S. House of Representatives, Committee on International Relations, Hearing: "Syria: Implications for U.S. Security and Regional Stability-Part I", September 16, 2003,
URL <http://wwwa.house.gov/international_relations/108/ros091603.htm>

[76] As of April 30, 2004 there are 162 State Parties to the CWC. For further information see the web site of The Organisation for the Prohibition of Chemical Weapons, URL <http://www.opcw.org>

Development of a chemical weapon capability

It is believed that Syria received its first chemical weapons, as complete chemical artillery munitions, from Egypt prior to the 1973 October War in 1972 or -73.[77] According to some reports, Egypt supplied Syria with both sarin and mustard gas filled artillery shells and aerial bombs. However, it is questionable whether Egypt possessed nerve agent at the time. Furthermore, it is also questionable whether Syria possessed delivery means to strike at population centres in Israel. The transfer of chemical ammunitions to Syria from Egypt must probably be seen as a search for deterrence against a believed threat from Israeli non-conventional weapons. It should be stressed that there are no reports of *any* use of chemical weapons during the October War.

After the October War, in which Syria was defeated by Israel, Egypt established a bilateral agreement with Israel that finally led to the Israel-Egypt peace agreement signed at Camp David in 1979. This development left Syria without a geographically close ally against Israel and, furthermore, the outcome of the 1982 Lebanon war further convinced Syria of Israel's conventional supremacy. In the following decision to develop a non-conventional capacity, Syria probably selected chemical weapons as an alternative with a reasonable short timeframe for development compared to the nuclear pathway.

At least one source states that the Soviet Union supplied Syria with "warheads for VX agents" between 1979 and 1982.[78] Except for this allegation there are few substantial reports of Syrian chemical weapons stockpiles prior to the mid-1980s.[79] The few reports mentioning Syrian stockpiles of chemical weapons often refer to the Soviet Union as the supplier. On the other hand, a 1992 report from The Simon Wiesenthal Centre clearly states that the Soviet Union had no interest in supplying chemical warfare agents, or weapons, to Syria.[80]

In 1983, a U.S. intelligence report stated that Syria probably had the most advanced chemical warfare capability in the Arab world. The report did not identify any Syrian facility for producing chemical weapons.[81] It might be reasonable to propose that if Syria possessed an offensive chemical weapons capacity prior to the mid 1980s this capacity was provided "ready made" by an external source.

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[77] A comprehensive history of the early Syrian CW program can be found in: Burke, G. M. and Flowerree, C. C., *International Handbook on Chemical Weapons Proliferation* (Greenwood Press: New York, 1991), ISBN: 0-313-27643-9.

[78] Beaver, P., 'Syria to make chemical bomblets for "Scud Cs"', *Jane's Defence Weekly*, 3 September. 1997.

[79] Burke, G. M. and Flowerree, C. C., *International Handbook on Chemical Weapons Proliferation* (Greenwood Press: New York, 1991), ISBN: 0-313-27643-9.

[80] Timmerman, K. R., *Weapons of Mass Destruction: Thecase of Iran, Syria, and Libya*, A Simon Wiesenthal Center Special Report from Middle East Defence News, 1992, ISBN 0-943058-14-7.

[81] Schweid, B., 'Syria Producing Chemical Weapons, Source Says', *The Associated Press*, 25 March, 1986.

In the late 1980s, it was reported that Syria had two facilities for chemical agent production.[82] The same report states that nerve agents where being loaded into modified Soviet supplied warheads. The chemicals were said to have been supplied by West German companies since the United States had banned exports of those products. Furthermore, the CIA Director William Webster testified in 1989 that "West European firms were instrumental in supplying the required precursor chemicals and equipment. Without the provision of these key elements, Damascus would not have been able to produce chemical weapons."[83]

These allegations have to be viewed against the background of the fact that the procurement of CW-related substances and know-how was not restricted by export control regimes to the same extent in the 1980s as it is today. In 1986, the Reagan administration included Syria in an export control list, banning the export of several CW precursors. This move can be seen as an official U.S. reaction on an emerging Syrian CW production capability.

In the 1990s, Syria was repeatedly mentioned as a possessor of an advanced chemical weapons capacity. Most reports mention the nerve agent sarin as the main chemical agent in the Syrian program but production of VX is also mentioned in the latter half of the decade.[84,85,86] At this time, some reports also mention Syria as a competitor to Iraq in building an advanced CW capacity.[87,88,89] The international community's unwillingness to take actions against the believed Syrian CW-capacity in the early 1990s can probably be explained to some extent by the fact that Syria was an important Arab ally against Iraq.

It is reasonable to conclude from existing literature that if a Syrian chemical weapons program existed prior to the early 1980s, it was probably of rudimentary nature. Several allegations, however, mention an advanced program as from the 1990s. It should be remembered that many, if not all, of these allegations emerge from Israeli or Western sources.

Chemical capacity today

It is interesting to note that few sources mention a Syrian large-scale production of mustard gas. The two chemical agents repeatedly mentioned, are the two nerve agents sarin and VX. In a 2003 unclassified report to Congress, CIA estimates that Syria is stockpiling sarin but still seeks foreign help when it comes to the development of "more toxic and persistent nerve agents" (this should

[82] 'Syria is producing chemical weapons', *Jane's Defence Weekly*, 29 November, 1986, p. 125.
[83] Webster, W., Prepared Testimony, Senate Committee on Governmental Affairs, 9 February, 1989, p. 5.
[84] Leshem, D., 'Syria's deadly secret', *The Jerusalem Post*, 6 May, 1997.
[85] 'Israel claims that Syria is making VX nerve gas', *Jane's Defence Weekly*, 7 May, 1997.
[86] Eshel, T., 'Syria to make vx gas, says Israel', *Jane's Defence Weekly*, 1 July, 1998.
[87] Ali, M., 'Iran, Syria and Iraq 'stockpiling chemical arms', *The Times*, 10 February, 1989.
[88] Sinai, R., 'Syria Believed to Match Iraq in Chemical Weapons', *The Associated Press*, 19 November, 1990.
[89] Eisenstadt, M., 'Syria 's Strategic Weapons', *Jane's Intelligence Review*, 1 April, 1993, p. 168.

probably be interpreted as VX). This statement contradicts some other sources stating that Syria is already producing VX (see above). It is also interesting to note that this brief CIA report stated that "Syria remains dependent on foreign sources for key elements of its CW program, including precursor chemicals and key production equipment".

Several alleged chemical agent production facilities in Syria are mentioned in the literature but not in any great detail. Two underground CW production plants situated in military areas were described in 1992. One is situated near the village of Safiya (Al-Safira) close to the Turkish border in the Allepo area, and the other south of the city of Homs.[90] Both are said to have been built in the early 1980s with some assistance from West European companies. A third production facility, capable of producing VX, is described in Hama.[91] Another facility in Lattakia (Latakia) is also mentioned by one source but no details are given though.[92] To our knowledge, there are no reports of decommission of any of these alleged facilities.

Two storage facilities for chemical ammunition are described in an article in the Bulletin of the Atomic Scientists; Khan Abu Shamat and Furqlus (approximately 40km SE of Homs).[93] There are probably several more storage facilities, for example at military bases.

Few reliable sources describe the current status of the Syrian delivery systems for chemical weapons. However, Syria has several ballistic missile systems (see 5.3.2) that could be equipped with chemical warheads. One report states that Syria has tested a Scud B tipped simulated chemical warhead.[94]

In 2003, the U.S. Secretary of Defence, Donald Rumsfeld, accused Syria of conducting several chemical weapons tests during the last 12 to 15 months, but did not mention any specific weapon systems.[95] France rejected this allegation and stated that they did not have any evidence of Syria's chemical weapon tests.[96] There is also a report of a Syrian live test of a chemical bomb; according to the article, a Syrian Air Force MiG-23 jet dropped a chemical weapons bomb on a test range.[97]

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[90] 'Syria 's Secret Poison-gas Plant', *Jane's Intellegence Report*, 10 September, 1992.
[91] 'Briefing document: Syrian CW programs', Mednews – Middle East Defense, Vol. 5, No. 24, 28 September, 1992.
[92] Shoham, D., 'Guile, Gas and Germs: Syria's Ultimate Weapons', *Middle East Quarterly*, Summer 2002.
[93] Hogendoorn, E. J., 'A Chemical Weapons Atlas', *Bulletin of the Atomic Scientists 53*, Sep./Oct. 1997, (It should be noted that this article refers to sources not available to the authors of this report).
[94] Isby, D. C., 'Syrian Scud carried a simulated chemical warhead', *Jane's Missiles and Rockets*, 1 September 2001.
[95] 'US warned over Syria stance', *BBC News (Web edition)*, 15 April 2003, URL <http://news.bbc.co.uk/2/hi/middle_east/2947571.stm>
[96] 'France has no proof that Syria tested chemical weapons – minister', *AFX European Focus*, 15 April, 2003.
[97] O'Sullivan A. and Adds I., 'Report: Syria tested chemical bomb', *The Jerusalem Post*, 28 November, 1999, (This article also refers to an Washington Times article).

According to a "senior Israeli" defence source in 2003, "at least 100 Syrian long-range ballistic missiles, equipped with VX" are aimed at central Israel.[98] It should however be noted that Syria, to our knowledge, has no access to any "long-rang" ballistic missiles, see below.

In conclusion, Syria probably has ballistic missiles fitted with chemical warheads, or at least the capability to in a reasonable short time-frame, equip missiles with this kind of warhead. The chemical agent of choice is probably sarin with a future option for the more persisting agent VX. It is also probable that chemical airdropped bombs exist in the arsenal.

Syria is retaining a production capacity of sarin and probably also mustard gas. It is questionable whether Syria has a domestic capacity for VX production.

6.3. Ballistic Missile Ambitions

6.3.1. Syrian Motivations

Syria's interest in ballistic missiles began in the 1970s when Israel's military superiority became increasingly apparent and was further enhanced by Tel Aviv's nuclear capability. According to U.S. and Israeli intelligence, the ambition to improve Syria's ballistic missile capabilities is high. Damascus historical legacy of Israeli antagonism has motivated Syria to "foster and maintain a high-level of operational preparedness, both to deter Israel and, if necessary, to launch effective strikes against it."[99] Motivations for the procurement of ballistic missiles also increased after the 1991 Gulf War when Syria more actively began to acquire Scud missiles and technology from foremost North Korea, but also indigenous development collaboration with Iran. The end of the Cold War showed that nations like Syria began to motivate ballistic missiles as the key to reach improved strategic deterrence, knowing that their conventional force was outdated compared to the Israeli military. Israel's conventional force is the most modernised in the Middle East, and thus Damascus most likely considers the attainment and development of ballistic missiles as a cheaper option than that of endeavouring on a mission in which it is impossible to attain conventional parity with Tel Aviv. It is imperative to remember that the information provided in this section is highly speculative since no official Syrian statements regarding their ballistic missile arsenal have been found. Unlike nations like North Korea, Iran and Libya, the Syrian government has not released any lavish pictures of their missile arsenal in extravagant military processions. Consequently, the information provided is mainly founded on Western and Israeli sources, hence an eventual bias has to be taken into consideration.

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[98] 'Syria's "nerve gas" missiles', *Jane's Foreign Report*, 31 July, 2003.
[99] "Syria," *The Wednesday Report: Canada's Aerospace and Defence Weekly.* URL<www.mobrien.com/twr/syria/syria.htm>

However, it is very conceivable that Syria possesses highly advanced strategic weapons through their Scud capacity. Allegedly, Damascus has the capability to threaten Israel with about 400 to 600 ballistic missiles, including FROG-7, Scud B, SS-21 Scud C, Scud D and M-9, all categorised as short-range missiles.[100] Any Syrian motivation to attain longer ranging missiles seems highly unlikely due to the close Israeli proximity of a 300 km range. The Syrian Scud arsenal is designed to carry chemical warheads armament, which makes it further imperative as Syrian deterrent.

The trend among so called 'rogue' states[101] to acquire and develop ballistic missiles, evident since the beginning of the 1990s, is most likely related to a number of advantages these weapons impose on these states. For nations like Syria, which does not possess the ability to project military power much beyond its own boarders, acquirement of ballistic missiles is motivated as 'cheap' weapons that are capable of creating fear and terror in states that are militarily and economically stronger. To Damascus, ballistic missiles are therefore weapons that represent strategic intimidation, and one can state that "ballistic missiles are the backbone of the Syrian posture, [and] that missiles effectively shape Syrian strategic orientation and operational preparedness as a whole." [102] Since the loss of the Soviet Union as a major military sponsor in the end of the 1980s, and Damascus incapability to reach conventional equivalence with Israel, Syria has become more and more reliant on strategic deterrence. The Syrian deterrence is therefore "based on ballistic missiles and chemical warfare capabilities as the ultimate guarantor of regime survival against potential regional adversaries."[103]

It is important to bear in mind that ballistic missiles are not weapons of mass destruction per se, but that they are capable of delivering conventional explosives or nuclear, chemical and biological warheads. Additionally, "ballistic missiles are well suited for WMD delivery due to difficulty to defend against, and its relative cost-effective delivery mechanism."[104] Syria has invested large amounts of its military budget in the purchase of ballistic missiles and the construction of plants for an indigenous production of foremost Scud missiles. The suspected simultaneous development and production of chemical agents to be used on Scud warheads show that Damascus regards ballistic missiles to be more of an

[100] The categorisation of ballistic missiles is based on their respective range: Short-range (SRBM) up to 1000km, medium-range (MRBM)1,000–3,000km, intermediate-range (IRBM) 3,000-5,500km, and intercontinental-range (ICBM) over 5,500km. URL<www.fas.org/nuke/intro/missile/basics.htm>

[101] **"Rogue" states:** Countries regarded as hostile to the United States and its allies and suspected of developing or deploying WMD. Though the U.S. State Department discourages use of this term, it is still used by some U.S. officials in reference to North Korea, Libya, Syria, Iran and Iraq. States of concern has replaced the term "rogue" states.

[102] "Syria," *The Wednesday Report: Canada's Aerospace and Defense Weekly.* URL<www.mobrien.com/twr/syria/syria.htm>

[103] *Proliferation: Threat and Response,* January 2001. Office of the Secretary of Defense. p. 43.

[104] "SAFE Citizen Brief #1: Ballistic Missiles Threats – A Primer," *The Safe Foundation,* URL<www.safefoundation.org/nmd/citizen_brief1.asp>

advantage than other means of delivery for WMD. Thus, the motivations behind Damascus eagerness to possess ballistic missiles to counter the Israeli military and nuclear supremacy should not be understated. In addition, Syria's acquirement of ballistic missiles has also assisted in the establishment of friendly relations with states proliferating missiles, missile technology and components, such as the former Soviet Union, China, and North Korea, and with Iran in the establishment of joint collaborations regarding the production of Scud missiles, see Appendix 4**.**

6.3.2. Syrian Missile Capabilities

In 2004 Syria has the largest stockpile of ballistic missiles, estimated to 400-600, in the Middle East. In order to maintain high capability, Damascus is investing most of its defence budget into its ballistic missile program at the expense of the Syrian ground forces and air force.[105] Syria has an indigenous production of Scud C, and most probably Scud D, a production made possible through the assistance of China, North Korea and Iran. Prior to Moscow entering the Intermediate Range Nuclear Forces Treaty (INF)[106], and the fall of the Communist bloc in 1989, the main supplier of ballistic missiles was the Soviet Union, but when the Cold War ended, Damascus turned towards East Asian proliferators, namely China and North Korea. Additionally, Syria and North Korea cooperates with Iran through a three-way agreement in which Iran functions as an intermediary transhipping Scud technology and equipment.[107] China has supplied M-9 launchers, technology and material needed for an indigenous production of ballistic missiles, and there are also unconfirmed reports of deliveries of the actual M-9 missile.[108] Moreover, Beijing has aided Syria in upgrading the Scud B armoury, provided by the Soviet Union in the mid 1970s. Since the beginning of the 1990s, North Korea has emerged as one of the main proliferators of ballistic missiles to Syria, and has supplied Damascus with Scud C and most likely Scud D.[109] In collaboration with China and Iran, North Korea has helped Syria in constructing tunnels and underground facilities at Aleppo and

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[105] Rubin, Uzi, "Beyond Iraq: Missile Proliferation in the Middle East," *Jerusalem Centre for Public Affairs,* URL<www.jcpa.org/jl/vp493.htm>

[106] The Treaty between the United States and the Union of Soviet Socialist Republics, signed in 1987, on the Elimination of their Intermediate-Range and Shorter-Range Missiles (the INF Treaty) was specifically designed to eliminate an entire class of U.S. and Soviet ground-launched ballistic and cruise missiles with ranges of 500-5500 km. Key provisions included a three-year timetable to eliminate these missiles, launchers, associated support equipment, support facilities, and training equipment. As required by the Treaty, by June 1991, the United States and Soviet Union eliminated all INF missiles (846 and 1846, respectively). "Intermediate Range Nuclear Forces Treaty (INF Treaty)", *Naval Treaty Implementation Homepage,* URL<http://www.nawcwpns.navy.mil/~treaty/INF.html>

[107] "DIA: Iran exporting missiles to Syria," *World Tribune.Com* URL<http://216.26.163.62/2002/me_iran_03_21.html>

[108] "China's Missile Exports and Assistance to Syria," *Centre for Nonproliferation Studies,* URL<http://www.nti.org/db/china/msyrpos.htm>

[109] Bermudez Jr, Joseph S. "A History of Ballistic Missile Development in the DPRK," *Centre for Non-Proliferation Studies.* Monterey Institute of International Studies. Occasional Paper No.2. November 1999.

Hama to store Scud missiles.[110] Thus, the more than three decades long cooperation with the aforementioned states has given Syria a strong ballistic missile capability. Even though no official statements on Syrian capacity have been found, when looking at the missile technology level of those states proliferating, the capabilities must be regarded as elevated.

The table shows the Syrian ballistic missile arsenal, including alternative names used by the nation of origin, range, Circular Error of Probability[111] (CEP), status, payload for warheads, and the country of origin regarding missiles or missile technology.

Syrian Missile Arsenal

Missile	Alternative Names	Range (Km)	CEP (m)	Payload (Kg)	Status	Country of Origin
FROG – 7	LUNA – M	70	500 – 700	550	In-use	U.S.S.R.
SCUD B	SS – 1C Shehab – 1 Hwasong 5	285 – 330	450	1000	In-use	U.S.S.R. Iran N. Korea
SS – 21	Scarab (9M79)	70 – 120	30 – 160*	500	In-use	U.S.S.R.
SCUD C	Hwasong 6 SS – 1D Shehab – 2	550 – 700*	50 – 700*	500 – 800	In-use	N. Korea U.S.S.R. Iran
SCUD D	No-dong 1 Hwasong 7 Shehab – 3	1000 – 1500*	50 – 190*	1000	Tested in 2000 – Status Unknown	N. Korea N. Korea Iran
M – 9	CSS – 6 DF – 15	600	280 – 600*	500 – 1000	Status Unknown	China China

Source: Compilation of Göran Danielsson, *Ballistiska Robotar och Kryssningsrobotar i Olika Stater* (FOA-R—94-00062-4.1—SE) and FAS – *Federation of American Scientists*

* Varies depending on original source.

[110] ”Missile Capabilities: Shehab-2 (Hwasong-6, Scud-C,)” URL<www.nit.org/e_research/profiles/Iran/Missile/3367_3394.html>

[111] Radius of a circle within which 50% of the missiles will land.

7. Conclusions and Discussion

Conclusions

Capabilities

There are strong indications that a Syrian chemical weapons program does exist. Syria most likely has a domestic production of nerve agents (sarin), and also production capabilities of corresponding means of delivery in the form of ballistic missiles and aerial bombs. This study has found no indications that Syria is harbouring an offensive biological weapons program, neither have any signs been found of research indicating any intentions of performing research for biodefence purposes. All available information indicates that Syria today focuses its nuclear ambitions in the civil sector. Syria does not have any ambitions for a military nuclear program, and the lack of economical and technical resources needed for such a program are vital arguments behind this conclusion.

Syria has a surprisingly well-developed pharmaceutical industry. The fact that the majority of the institutes are privately owned, and that some of them have international contacts with other Western pharmaceutical companies, speak against any larger organised R&D on production for illegitimate purposes. Still, the fact that Syria has a capacity that could be used for production in an offensive BW program, makes it important to integrate this country into the multilateral processes for reducing the biological threat. The Syrian oil industry, along with production facilities for fertilisers and some other chemical compounds, can probably function as a raw material source for the production of nerve agents. However, it is still questionable whether Syria can manage a domestic production of more advanced nerve agents, from the raw material to the finalised product.

Incentives

A dominant trigger for starting the development of non-conventional weapons programs in Syria can be found in the military defeat in the 1973 October War, in which Damascus realised that it needed to achieve a deterrence capability that could match the Israeli conventional and nuclear weapon arsenals. Spurred by the lack of international concern in regards to regional chemical warfare performed by Egypt and Iraq, the Syrian program for chemical weapons was established during the 1980s. Also the withdrawal of support from the Soviet Union in the mid-80s enhanced Damascus' incentives to build a non-conventional deterrence potential.

The aftermath of the 1991 Gulf War made the international community aware of the WMD potential harboured in the Middle East, and was the first disincentive to face Syrian WMD ambitions. This became even more obvious when different export control regimes were strengthened in the mid-90s, following the revelation of Iraq's WMD arsenal. The fact that Syria realised that the conflict with Israel

could not be solved by military aggression probably changed the Syrian doctrine when it comes to using WMD; from a possible tactical use of chemical weapons on the battlefield to a capacity for strategic deterrence through ballistic missiles. Even so, Syria's ballistic missile arsenal should not be considered as offensive posturing, but mainly as deterrence towards Israel. With its outdated military machinery, including poor air capability, missile acquirement has been the "cheapest" and "easiest" way for Damascus to increase its strategic defence capability. Today's arsenal is estimated to several hundred ballistic missiles, of which a certain number could be tipped with chemical warheads.

The international community's concern in regards to weapons of mass destruction in the Middle East has changed from being "fairly moderate" in the 1970s and 80s, to the present view of the "greatest security risk of this decade," and this has affected the present Syrian security policy context. After the war on Iraq in 2003, and the Libyan denouncement of weapons of mass destruction, the Syrian regime has been forced to enhance its strategy to counter international allegations of WMD ambitions and possession. The evident Syrian strategy, when examining recent statements from Syrian President Bashar, is to justify possession of any weapons. The argument is that the country is at war against a State Party (i.e. Israel), generally considered to possess a large nuclear arsenal. International demands of Syrian renouncement of WMD have also repelled towards Israel by Damascus calling for the creation of a WMD-free zone in the Middle East region. Damascus also faces increased international pressures since it is often linked to other states with perceived WMD ambitions, such as North Korea and Iran.

In addition, the events of September 11, 2001, and the following "war on terror", a strategy not making any distinction between terrorists and the states that harbour them, has put vast pressure on Syria and led to tense relations with the United States. This, along with a growing international concern and a strained economy, has made the Syrian situation of WMD development and procurement more intricate.

In summary, yesterday's incentives for building WMD capacities had little political implications for the Syrian regime, but in 2004 these incentives have transformed into increased political and economic burdens. However, as long as Israel remains a nuclear state and a perceived threat by Damascus, strategic deterrence including chemical weapons and ballistic missiles will most likely remain.

Discussion

To conclude this report, some important issues regarding Syria's future implications in the context of WMD and international relations are hereafter discussed.

Syria and the EU association agreement

The association agreement with the EU constitutes a breaking point for the Syrian regime, whether it will face an increased isolation, mainly represented by U.S. sanctions, or enhanced relations with the EU and the countries in the Mediterranean Basin.

At present (April 2004), Syria is the only country in the Barcelona Process which is subjected to a non-proliferation clause in the agreement, due to the new EU non-proliferation policy adopted in late 2003. The EU does not agree on how harsh the wording should be. There are positive estimates made by the EU regarding the potential in a concluded agreement with Syria.[112] At the same time, there are member states within the EU which advocate a policy in line with the U.S., emphasising the WMD and non-proliferation issues in EU relations with Syria.

It is unlikely that Syria will adhere to the original wording of the non-proliferation clause in the agreement, especially since the same demands have not been applied to the eleven other countries in the Barcelona Process, including Israel. The incentives for the regime to regain a strong position in the region and especially concerning the Arab-Israeli conflict, probably advocated by the old guard surrounding president Bashar, will not easily be affected by EU demands through the association agreement. However, EU has leverage against Syria through the Barcelona Process and the association agreement, a leverage EU should use while it still constitutes one.

Syria – an unlikely secondary proliferator on its own

The interesting context regarding Syrian motivations and capabilities concerning ballistic missiles is the underlying build-up of relations that has occurred within the past decades. North Korea possesses and develops medium, long-range and intercontinental missiles, and additionally has a nuclear program and possesses nuclear technology. China maintains nuclear capability, and Iran has domestic production of Scuds, and some nuclear capacity. If North Korea was to supply Syria with nuclear technology to be of use in the making of Scud warheads, and the three-way partnership with Iran was to be extended to the nuclear realm, the strategic situation versus Israel and neighbouring Arab nations would be drastically altered, and have severe consequences on the Middle Eastern region as a whole. An additional future concern would be Syria becoming a “secondary proliferator,” i.e. a previous buyer of ballistic missiles and missile technology, which decides to proliferate the weapons developed and procured. However, it is unlikely that Syria on its own would become a second generation proliferator since it is heavily dependent upon outside assistance in their domestic production of ballistic missiles, but the partnership with North Korea and Iran could be a

[112] The European Commission’s delegation to Syria. “Potential impact of a EU-Syria Association Agreement”, URL <http://www.delsyr.cec.eu.int/en/eu_and_syria/eu_syr_association_agreement/2.htm>, 11 May, 2004.

crucial factor in a secondary proliferation scenario involving Syria. In sum, the development of the Syrian ballistic missile capabilities has established a network that could possibly become an interesting entity in the future Middle East.

Due to Syria's CW capacity and geographical position in a region filled with turmoil, there will always be a slight possibility of these weapons falling into the hands of groups with hostile intent. The risk of Syria purposely transferring CW to Islamic militant organisations, such as al-Qaeda, can be excluded due to the regime's deeply hostile attitude towards Islamic fundamentalism. The same can most likely be said of Palestinian resistance groups, although these have been used by Damascus for many years as confrontational tools against Israel, since it would be counterproductive for the Syrian regime in the present political context to extend its support for these groups by other means than political ones.

Future Syrian policy development

It can be speculated that the prospective Syrian policy is likely to develop in one of three vastly different directions. An important question, to judge which of these scenarios is the most likely one, is to determine whether the old nomenclature or the Bashar leadership will decide Syria's future policies.

- Syria seeks acceptance in the West

As a trade-off with the West, Syria may sign WMD treaties like the CTBT and BTWC. It may also sign an Additional Protocol. Signing these documents will not affect Syria at heart, as the signing of these treaties does not constitute a de facto deviation from current WMD programs. However, to retain its deterrence capability, Syria will unwillingly discuss the CWC as long as Israel maintains its WMD capabilities.

- Syria preserves status quo

Syria values the political price for developing trade relations as being too high and decides to develop a wait-and-see attitude. This attitude prevents Syria from seeking alliances aimed at improving its deterrence capability, and might lead to a stalemate in which Syria strives to preserve status quo.

- Syria deepens its relations with WMD states of concern

Under this scenario, one might see Syria expanding its contacts with Iran and North Korea. The U.S. will, whether or not George W. Bush wins the election, be reluctant to lead a new invasion of an Arabic state. Other states than North Korea might withdraw from the NPT and a general proliferation upsurge could develop, in which Syria becomes one of the major players.

Appendix 1: Critical Source Reading

This report is solely based on open source literature and it is with some concern that the authors have noticed a quite high degree of cross referencing and non-critical citing between different sources.

One example of the somewhat irresponsible referencing that occurs within the body of literature that discusses the alleged Syrian access to an unconventional capacity, is the information found in an article from the well renowned Jane's Information Group.[1] In this article a second article, published in the Daily Telegraph by Stephen Pollard, "a senior fellow at the Centre for the New Europe in Brussels", is cited.[2] The Pollard article argues that it is now time to put international pressure on Syria to eliminate the threat from its non-conventional weapons, is in its turn more or less completely based on information gathered from one single source, namely the Dany Shoham paper "Guile, Gas and Germs: Syria's Ultimate Weapons," which appeared in the Middle East Quarterly Summer edition 2002 (see the table below for a text comparison of the three articles).[3] However, it should be emphasised that both Jane's and Pollard clearly states from where their information originates, but unfortunately no information is found in the Jane's article identifying Dany Shoham as the original source.

The Centre for the New Europe (CNE) in Brussels profiles itself as a right-wing liberal "think-tank" and policymaker.[4] Stephen Pollard is a CNE staff member responsible for directing the health policy program.[5] It is in our opinion reasonable to question whether Mr Pollard has enough insight into the subject of chemical and biological weapons to propose them as a reason for putting economic and/or military pressure on Syria.

Dany Shoham has a PhD in microbiology and is a Research Associate at the Begin-Sadat (BESA) Centre for Strategic Studies at Bar-Ilan University in Israel.[6] According to The Ariel Centre for Policy Research, he is a former Lieutenant Colonel and senior analyst in military intelligence in the Israel Defence Forces (IDF), and has published extensively on the subject of chemical and biological weapons in the Arab countries.[7] Dr. Shoham is unquestionably a world authority on non-conventional weapons in the Middle East but it is in our opinion troublesome that his, and presumably Israel's,

[1] 'Syria's "nerve gas" missiles', *Jane's Foreign Report*, 31 July, 2003.
[2] Pollard, S., 'If Syria isn't next on America's hit list, it certainly should be', *The Daily Telegraph*, 15 April, 2003.
[3] Shoham, D., 'Guile, Gas and Germs: Syria's Ultimate Weapons', *Middle East Quarterly*, Summer 2002.
[4] Centre for the New Europe (CNE), URL <http://www.cne.org/about2.htm>
[5] CNE Health, URL <http://www.cnehealth.org/index.htm>
[6] The Begin-Sadat (BESA) Center for Strategic Studies,
URL <http://www.biu.ac.il/SOC/besa/Ndanny_shoham.html>
[7] The Ariel Centre for Policy Research, URL <http://www.acpr.org.il/people/dshoham.html>

view is presented in a well renowned publication (Jane's) without clearly stating the origin of the information.

Syria's 'nerve gas' missiles Jane's Foreign Report, July 31, 2003.	"In reality, however, the SSRC, later placed under military supervision, was the cover for chemical weapons production. Stephen Pollard, a senior fellow at the Centre for the New Europe in Brussels, recently wrote in the London Daily Telegraph that a Syrian company "imported 90 tons of trimethyl phosphate, ostensibly for the production of an insecticide. Trimethyl phosphate is a precursor of nerve agents. Another factory, the Borosilicate Glass Project, had as its real purpose the production of dichloro - the main source of sarin. Similar plants, for sarin, VX and mustard gas, were set up near Damascus, Hama, Homs, Aleppo and Lattakia. There are a further dozen supposed 'pharmaceutical' factories."""
If Syria isn't next on America's hit list, it certainly should be Stephen Pollard, The Daily Tele-graph, April 15, 2003.	"The Syrian company Setma imported 90 tons of trimethyl phosphate, ostensibly for the production of an insecticide. By an astonishing coincidence, trimethyl phosphate just happens to be a precursor of nerve agents. One factory - the "Borosilicate Glass Project" - had as its real purpose the production of di-chloro - the main source of sarin. Similar plants, for sarin, VX and mustard gas, were set up near Damascus, Hama, Homs, Aleppo and Lattakia. There are a further dozen supposed "pharmaceutical" factories."
Guile, Gas and Germs: Syria's Ultimate Weapons Dany Shoham, Middle East Quarterly, Summer 2002.	"For example, a Damascus company named Setma imported ninety tons of trimethyl phosphate from an Indian company, supposedly for the production of the organophosphate insecticide DDVP. The compound is a precursor of nerve agents." *and* "It was the SSRC that set up the first facility for the industrial production of chemical weapons: the "Borosilicate Glass Project," outfitted by the West German glass company Schott. The components of the facility included chemical-reaction vessels and pipes, all of them chlorine-resistant. The project produced di-chloro, a substance that is the main source of the nerve gas sarin." *and* "Press reports have placed production sites for sarin nerve agent, VX nerve agent, and mustard gas in plants near Damascus, Hama, Homs, Aleppo, and Lattakia-all around the country. Some or all of these facilities were founded ostensibly as civilian extensions of the SSRC. Syria can also tap the production capability of over a dozen government-controlled pharmaceutical plants, likewise spread across the country."

Another example of a possible use of a non-referenced source can be found by comparing a statement made by US Congress woman Ileana Ros-Lehtinen, before the U.S. House of Representatives entitled 'Syria: Implications for U.S. Security and Regional Stability' on September 16, 2003,[8] with an article in the Middle East Quarterly in 2002, again written by Dany Shoham and entitled "Poisoned Missiles: Syria's Doomsday Deterrent", see below.[9]

Hon. Ileana Ros-Lehtinen	**Dany Shoham**
The Center's (SSRC) published studies point to work with germs and proteins, and report that the Center's scientists have trained in France in the fields of toxicology and virology.	*The center's (SSRC) published studies point to work with germs and proteins, while the center's scientists have trained in France in the fields of toxinology and virology.*
It has also been reported that the smallpox virus was delivered to Syria from Russia for bioweapons development	*It (smallpox) is assumed that with its development and production as a biological weapon by Russia, it was secretly delivered to Syria*
Scholarly and media sources state that production facilities for chemical weapons in the Aleppo area, and at other sites, also include biological weapons facilities.	*It is believed that production facilities for chemical weapons, in the Aleppo area and at other sites, also include wings for biological weapons*
…in April 2000, in a lengthy article published by the Syrian Defense Minister. In this article entitled: "Biological Germ Warfare: A New and Effective Method in Modem Warfare", the Syrian Defense Minister spoke about the military's plan to integrate biological weapons in its tactical and strategic arsenals.	*The Syrian military is also beginning to plan the eventual integration of biological weapons in its tactical and strategic arsenals. In April 2000, Syrian defense minister General Mustafa Talas published a lengthy article entitled "Biological (Germ) Warfare: A New and Effective Method in Modern Warfare."*

[8] Ros-Lehtinen, I., 'Syria: Implications for U.S. Security and Regional Stability-Part I', Statement before the *U.S. House of Representatives, Committee on International Relations, Subcommittee on the Middle East and Central Asia*, 16 September, 2003,
URL <http://wwwa.house.gov/international_relations/108/ros091603.htm>

[9] Shoham, D., 'Poisoned Missiles: Syria's Doomsday Deterrent' , *The Middle East Quarterly*, vol.9, no. 4, Fall 2002, URL <http://www.meforum.org/article/510>

Appendix 2: Capabilities Relevant for Potential WMD Programs

Educational Level

Education and policies for science and technology

Syria has a Ministry of Higher Education responsible for preparing plans for research in higher education establishments and also coordinating research plans between different research actors in the country.[10] According to Alwan and Obeid, directives given by the President in 1992 and 1994 boosted scientific research and resulted in plans for policies and strategies for scientific research, both concerning goals for the research as well as how the funding should be organised. The importance of this initiative is shown by the fact that the proposal was presented to the Prime Ministry for approval. After the directives of the President, scientific research activities increased considerably.

There are four universities in Syria: Damascus, Aleppo, Al Baath University at Homs and Teshreen University at Latakia. All four are financed by the Ministry for Higher Education and they all cover theory and practice in all fields and offer the same courses, with a few exceptions. There are some specialisation; medical research is prioritised at Damascus university while agricultural research is the primary choice at Aleppo.[11]

Training of researchers is, according to Alwan and Obeid, hampered by a number of obstacles specific to Syria's cultural, economical and geopolitical situation. Heavy industry is not profitable enough in Syria due to lack of local markets. This results in very little need for R&D. However, in recent years, the funding when it comes to training researchers has increased and that, along with improved relations with the European Union, have produced almost 400 university grants from the French government. A number of students from Syria are also attending courses in different OECD countries. Some examples of this can be found in table 1.[12]

[10] Alwan, M. and Obeid, N. E. C., Collaboration between Educational and Research Institutes and Industry in Developing Countries: Experience of Syria and HIAST.2000. Conference proceedings from the conference on Scientific Research Outlook in the Arab World in the New Millennium, Sharjah, April 2000, URL <http://nmit.georgetown.edu/papers/alwanobeid.htm>

[11] Alwan, M. and Obeid, N. E. C., Collaboration between Educational and Research Institutes and Industry in Developing Countries: Experience of Syria and HIAST.2000. Conference proceedings from the conference on Scientific Research Outlook in the Arab World in the New Millennium, Sharjah, April 2000, URL <http://nmit.georgetown.edu/papers/alwanobeid.htm>

12 Organisation for Economic Co-operation and Development, Education Statistics and Indicators, 2003, URL <http://www.oecd.org/document/34/0,2340,en_2649_34515_14152482_1_1_1_1,00.html>

Table 1.

Country	No. of students
France	1400
United States	618
Germany	322
United Kingdom	248
Turkey	231
Austria	83
Spain	75
Poland	59
Belgium	56
Italy	49
Hungary	48
Sweden	35
Japan	33
Czech Republic	30
Slovakia	30
The Netherlands	22
Australia	20

The high percentage of foreign scientific training is also demonstrated by the fact that 24 of 27 PhDs or MDs, who had published their *curriculum vitas* on the website arabscientist.org in December 2003, had presented their dissertations at foreign universities: Thirteen of these Doctors had been trained in Western Europe (seven in France, four in Germany, and two in the UK), three in Eastern Europe (Poland, Romania, and Slovakia), and eight in the Soviet Union or states belonging to the former Soviet Union (two in Russia, two in Ukraine, one in Armenia and one in Kazakhstan). The particular aim of the arabscientist.org website is to attract foreign contacts. This fact, and the limited number of scientists attached to it, probably skews the percentage towards those with foreign training. Anyway, they further underscore the fact that foreign training has been significant for the scientists and technicians currently active in Syria.

Relations between industry and research are generally extremely weak, except for in the information technology sector. Most researchers are still trained overseas (see table above) causing problems since they do not meet the demands of local industries. The existing public research centres, the Centre for Scientific Studies and Research and the Ministry of Agriculture's Agricultural Research Department, lack the legal and financial instruments for establishing the ties with both the public and the private sector to launch research programs which could meet the country's technological requirements.

Scientific publications

One way of understanding the scientific potential of a country is to examine the number of scientific publications found in databases. A search on Syrian universities and what has been published since the mid-sixties (with translated titles or abstracts to English) produced very few "hits". Only 279 articles were found while searching the databases MEDLINE (1966-2003), BIOSIS (1969-2003) and CHEMABS (1967-2003) using the search profile "Univ" AND "Syria".

As a comparison, we performed similar database searches on a number of countries using the same search profile, i. e. "univ" AND "country", and the result are shown in table 2.

Table 2.

Country	No of "hits"
Syria	279
Iraq	5053
Pakistan	6621
Jordan	8026
Iran	15610
Egypt	59200
Israel	105616

As shown above, Syria has by far the smallest number of published articles. An explanation might be that a majority of papers on research conducted at the universities are published in local specialist periodicals issued by the four universities, and therefore probably not covered by the databases. Only few papers are submitted to international journals using a peer-review system.[13] This makes it difficult to get an understanding of where the scientific priorities are made in regard to different research disciplines and to identify level of scientific skill in the country. The fact that so few scientific papers are published in international journals might also be explained by assuming that the scientific level in Syria is so low that submitted papers are rejected.

Also while performing database searches on the Scientific Studies and Research Centre (SSRC) and the Higher Institute for Applied Sciences and Technology (HIAST), very few "hits" (3 for SSRC and 6 for HIAST) were produced. This is strange considering the size of these institutes. The papers from SSRC discussed environmental issues and corrosion while the HIAST publications were mainly dealing with physics.

[13] Alwan, M. and Obeid, N. E. C., Collaboration between Educational and Research Institutes and Industry in Developing Countries: Experience of Syria and HIAST.2000. Conference proceedings from the conference on Scientific Research Outlook in the Arab World in the New Millennium, Sharjah, April 2000, URL <http://nmit.georgetown.edu/papers/alwanobeid.htm>

Within the field of microbiology there were five papers of interest. These papers were dealing with the optimisation of penicillin production (3 papers), the occurrence of aflatoxin in Syrian food (1 paper), and a staining metod for bacilli (1 paper).

Published Microbiology-related Research

Three other papers were found when searching databases using Syria as the affiliation for the research but focusing on a number of diseases considered as potential BW agents. Many of these diseases are causing both diseases in humans and in animals and considering the latter, some of these diseases should be of some interest to researchers in Syria. The numbers of publications on these organisms using Syria as affiliation were very few, as shown in table 3. The focuses of these publications are the epidemiological aspects of the diseases.

Table 3. Syrian publications on various organisms

Anthrax or *Bacillus anthracis*	0
Plague or *Yersinia pestis*	0
Glanders or *Burkholderia* or *Pseudomonas mallei*	0
Meliodosis or *Burkholderia* or *Pseudomonas*	0
Brucellosis or *Brucella*	2
Q fever or *Coxiella burnettii*	0
Tularemia or *Francisella tularensis*	0
Smallpox or *Variola*	0
Encephalitis virus	1

An explanation of the apparently low interest in those diseases might be, except for the fact that Syrian scientists do not publish in international journals, that the epidemiological situation in Syria is unclear. No disease outbreaks in Syria were reported to the WHO 2000-2003.[14] Also on the ProMed website very few hits were found on Syria from 1994-2003. The 9 “hits” were on plants and animals (Foot and Mouth Disease in 2002-2003).[15] In this context, it should be taken into consideration that there are differences between countries in which way the reporting of outbreaks is performed. The explanations for that can vary but this fact introduces an element of non-comparability into the disease outbreak surveillance systems.[16] This presumed underreporting of diseases is not specific to Syria. Comparisons made with two other neighbouring countries (Jordan and Lebanon) gave the same result, i. e. no outbreaks were reported to the WHO and a few animal and plants diseases in ProMed.

[14] World Health Organisation, Recent disease outbreaks, 2000-present, Syrian Arab republic, URL <http://www.who.int/disease-outbreak-news/country/SYR.htm>

[15] International Society for infectious diseases, ProMed mail, URL <http://www.promedmail.org/pls/askus/f?p=2400:1200:424240>

[16] World Health Organisation, Communicable Disease Surveillance & Response, URL <http://www.who.int/csr/resources/publications/introduction/en/index4.html>

One source has been found stating that anthrax is endemic in this region[17] (although no cases have been reported by the WHO or ProMed) and research done on this disease should be prioritised, if not for other reasons than it might affect the live stock of the country. Syria is said to have a vaccination program against anthrax. Also SSRC is said to be working on anthrax, but no publications have been found from that institute.

Published Nuclear-Related Research

Also, we have made an effort to trace as many Syrian nuclear research papers as possible. The search was set up to find papers primarily relating to nuclear chemistry, radiochemistry, nuclear technology, or nuclear physics originating from Syria. In all, we found 70 papers. As clearly demonstrated in table 4, the great majority of nuclear-related scientific papers from Syria originate from the AECS.

Table 4. Origin of Syrian nuclear-related scientific papers

Location	1982-1990	1991-2000	2001-2003
AECS	3	46	13
Univ of Damascus	1	2	1
Tishreen Univ, Latakia	1	1	
Baath Univ, Homs		1	
Ministry of Electricity, Damascus	1		
	6	50	14

An attempt to categorise the Syrian papers in different scientific fields gave this result:
Radiochemistry (25)
Reactor Technology (11)
Radio Physics, Radiation Protection & Dosimetry (10)
Nuclear Medicine (4)
Applied Research (agriculture, industry) (3)
Neutron Activation Analysis (3)
Nuclear Energy (3)
Radiation Effects on Electronics (3)
Ecology & Radioecology (2)
Nuclear Physics (2)
Nuclear Waste Management (2)
Mathematics (1)
Other (1)

The majority (54) of the research papers found were written in English, 13 in Arabic, two in Russian and one in German. As expected, the topics of the research papers seem to match with known nuclear facilities in Syria.

[17] Nuclear Threat Initiative, Syrian profile, Biological Facilities,
URL <http://www.nti.org/e_research/profiles/Syria/Biological/3342_3343.html>

One interesting aspect is to what extent foreign collaboration has served as the basis for Syrian nuclear research papers. Only ten such papers could be found, which was somewhat less than expected. Seven of the papers that surfaced in our investigation were affiliated with Western Europe Institutes and Universities, two with Russian ones, and one with an Egyptian institute. One plausible reason for the rather meagre outcome might be that Syrian students during their studies abroad simply have not been attached to an affiliation in Syria.

Facilities and capabilities

Nuclear Capabilities

Atomic Energy Commission of Syria (AECS)

The Atomic Energy Commission of Syria (AECS) was established in 1979 as a separate body dealing with nuclear issues. It is an autonomous institution affiliated to the Prime Minister.[18] Nearly all traceable Syrian nuclear-related research has been conducted under the auspices of the AECS. The current Director General is Professor Ibrahim Othman, who seems to be an active researcher rather than a bureaucrat, as he has published several of the Syrian research papers found.

After its foundation in 1979, this establishment, in the early half of the 1980s, worked with the Syrian Ministry of Electricity and the IAEA to develop plans for the introduction of nuclear power in Syria. Aided by the IAEA, the AECS's first major development was a nuclear analytical laboratory that was set up during the 1980s.

In January 1982, a paper by Prof. A.O. Youssef, the Minister of Electricity in Syria at the time, appeared in *Nuclear Engineering International*.[19] In his paper, Prof. Youssef came to the conclusion that a joint Arab nuclear fuel cycle had to be established. By recovering uranium from rich resources in phosphate rock, Arabs could become self-sufficient in nuclear fuel. As phosphates were already extracted from rock as fertilisers, this approach was highly economical according to the minister. One problem, foreseen by Prof. Youssef, connected to nuclear power development was the electric grid in the Arab world, which at the time was too weak to carry a nuclear power plant. A graph in the paper demonstrated the optimistic view that by the year of 2000, the Arab world would produce 20 GWe from nuclear power.

The Syrian Research Reactor

Around 1990, the construction began at the Der Al-Hadjar Nuclear Research Center near Damascus. The following year, the installation of Syria's first, and so far only, reactor (SRR-1) was initiated. It is a small 30-kW research reactor of Chinese origin (miniature neutron source reactor), although it is widely known that the Chinese to construct it, "borrowed" a Canadian design, the

[18] International Center For Agricultural Research In The Dry Areas, Aleppo, Syria. The National Agricultural Research Systems In The West Asia And North Africa Region, Ed: Joseph Casas, pp. 169-182, (1999). URL<http://www.icarda.cgiar.org/NARS/Syria.pdf>

[19] Youssef, A.O., Co-operation is the key to Arab nuclear development, *Nuclear Engineering International,* 27:322, pp. 13-14 (1982).

Slowpoke reactor.[20] The reactor, which is under IAEA Safeguards and utilises 1 kg 90% highly enriched uranium (HEU), went critical on March 4, 1996. The reactor is the cheapest reactor currently available, but it can be quite useful in reactor physics education and training.[21] It can produce neutrons for neutron activation analysis, and isotopes for industrial and environmental analysis. This type of reactor has no immediate military applications. According to the IAEA Research Reactor Database, the only application so far for the reactor has been neutron activation analysis. Three operators have performed 1.371 experiments up to September 26, 2002.[22]

The small Syrian research reactor has a limited number of applications and Syria has therefore sought to acquire a larger research reactor, like the Iranian TRR at the Teheran Nuclear Research Centre, which has an effect of 5 MW.[23] For that reason, negotiations were held with both Argentina and India in the early 1990s, but on both occasions negotiations broke down, probably following pressure applied by the United States, on the states planning to deliver the equipment.

Since the late 1970s, Syria's main ambition has been to acquire at least one nuclear power reactor. On several occasions, reports have circulated that Syria has closed such reactor deals with the U.S.S.R. or Russia but nothing has been substantiated.

Cyclotron Facility

In 1996, a project began to construct a cyclotron facility at the Dubaya Centre of the AECS. The cyclotron was bought from a Belgian company, Ion Beam Applications, and the building and installation over the following years was supervised by the IAEA. By 2002, the facility for the production of short-lived radionuclides had been completed, tested and made operational. In all, new buildings, support services, and the cyclotron cost Syria more than US$ 10 millions. The cyclotron facility is the crown jewel of the Nuclear Medicine Centre. Techniques such as positron emission tomography (PET) and single photon emission computed tomography (SPECT) will surely contribute to modernising national health care.[24] Short-lived radiopharmaceuticals, which previously had to be imported, can now be produced on-site in Syria. Some very short-lived isotopes, such as Fluorine-18, were previously not available for use in Syria.[25]

[20] Kyodo News International, Inc., 25 January, 2000, Chinese spies reportedly stole Canada's nuclear technology.
[21] Böck, H., Villa, M., Survey of research reactors, (MNSR). URL<http://www.reak.bme.hu/nti/Education/Wigner_Course/Wignermanuals/Bratislava/Research_Reactors_I.htm>
[22] IAEA, Nuclear research reactors in the World. URL<http://www.iaea.org/worldatom/rrdb/> (accessed 21 November, 2003).
[23] The nuclear power reactor Russia is building at Bushehr in Iran will have an effect of 1000 MW.
[24] IAEA, Technical Co-Operation Report For 2002 - Report By The Director General, GC(47)/INF/8 (2003).
[25] IAEA, Technical Co-Operation Report For 1999 - Report By The Director General, GC(44)/INF/3 (2000).

Chemical and Biological Capabilities

Scientific Studies and Research Centre (SSRC)

The SSRC was established in 1969 with the incentives to develop and coordinate research in Syria. The centre is also involved in education consulting, manufacturing and maintenance and consulting.[26]

One of SSRC's goals is to establish research and development projects needed for the economical and social development of the country, particularly focusing on the computerisation of governmental enterprises and institutions. Being responsible for the development of science and technology in Syria, SSRC has also generated cooperation with Western companies.[27]

The centre is said to be the main contributor of R&D to the Syrian military and has been accused of being a key player in the development of Syrian WMD programs. It is also alleged by Western agencies as being the responsible actor for procurement, research, development, and production activities associated with the Syrian BW/CW programs as well as being a missile warhead bomblet production facility.[28]

Higher Institute of Applied Sciences and Technology (HIAST)

There is one engineering college in the country, the Higher Institute of Applied Sciences and Technology (HIAST). It was established in 1983, based on the French model, and has trained over 100 engineers in Europe, in co-operation with the leading French colleges. The HIAST focuses on education in science and technology. One of the goals of the HIAST is aiming at filling the gaps between higher education, research and industries. Some of the disciplines taught concern electronic systems, computers, mechanical engineering and applied physics. Students at the HIAST also do industrial training. International projects are also carried out in cooperation with foreign universities and international organisations. The HIAST is affiliated with the Scientific Studies and Research Center[29], and students chosen for scholarships are considered SSRC employees.[30]

[26] International Federation for Information Processing, URL<http://www.ifip.or.at/members/syria.htm>
[27] Nuclear Threat Initiative, Syrian profile, Biological Facilities,
URL <http://www.nti.org/e_research/profiles/Syria/Biological/3342_3343.html>
[28] Nuclear Threat Initiative, Syrian profile, Biological Facilities,
URL <http://www.nti.org/e_research/profiles/Syria/Biological/3342_3348.html>
[29] Alwan, M. and Obeid, N. E. C., Collaboration between Educational and Research Institutes and Industry in Developing Countries: Experience of Syria and HIAST.2000. Conference proceedings from the conference on Scientific Research Outlook in the Arab World in the New Millennium, Sharjah, April 2000, URL <http://nmit.georgetown.edu/papers/alwanobeid.htm>
[30] URL<http://www.leb.net/pipermail/iss/1996-April/000403.html>

Environmental and Scientific Research Center and the Syrian – Kuntsevich connection

In 1996, the Israeli Minister of Defence, Yitzhak Mordechai, stated that Russia was aiding Syria in the development of advanced chemical weapons agents.[31]

It is well known that General Anatoliy D. Kuntsevich, who among other things was a former chairman of the Russian Presidential Committee on CBW Conversion Problems, was charged in Russia for selling chemical agents precursors to Syria in 1993.[32] The substance mentioned in the allegation (815 kilograms methylphosphonyl dichloride) is a precursor for nerve agents. It should however be noted that 800 kilograms of this type of precursor is nowhere near the amounts needed for nerve agents production in a large-scale chemical weapons program. The charges have later been dropped. In November 1995, U.S. imposed sanctions on him because he had been "engaged in chemical weapons proliferation activities".[33] The sanctions were lifted in 2004, two years after the death of General Kuntsevich on April 3, 2002.[34]

An interesting angle on this Russian-Syrian connection is found in a testimony before a U.S. Senate committee by the Russian whistleblower Vil Mirzayanov in 1995.[35] According to Mirzayanov, General Kuntsevich was responsible, on the Russian side, for a Russian-Syrian joint effort to set up a "Pan-Arabic Ecological Centre" around 1992. The centre was supposed to be dealing with ecological problems but also with problems connected to the protection against chemical weapons. Mirzayanov also states that a Russian institute, previously known for its involvement in the Soviet chemical weapons program, the State Research Institute of Organic Chemistry and Technology (GosNIIOKhT), synthesised standard samples of chemical agents sent to Syria.

These shipments are confirmed in an interview with General Kuntsevich in 1996.[36] According to the interview, the Soviet Union did also send personnel earlier on to Syria to train the Syrians in protection against chemical warfare.

Reliable information about the "Pan-Arabic Ecological Centre" is, to our knowledge, scarce in the literature except for in the Mirzayanov statement and in the Kuntsevich interview mentioned above. It is neither found in any of the major scientific or news databases, nor in a survey made in 1999 of the Syrian

[31] Syria developing nerve gas with Russians' help: minister, *Agence France Presse*, 17 November, 1996.
[32] See: News Chronology, 20 October, *Chemical Weapons Convention Bulletin*, p. 24, December, 1995, and references therein.
[33] Federal Register *Imposition of Chemical and Biological Weapons Proliferation Sanctions On A Foreign Person*, 6 December, 1995, Vol. 60, No. 234, pp. 62526-62527.
[34] Yurkin, A., 'USA unblacklists Russian scientist who died 2 years ago', *ITAR-TASS World Service*, 2 April, 2004.
[35] Mirzayanov, V., Testimony November 01, 1995, Senate Government Affairs Permanent Subcommittee on Investigations Proliferation of Weapons of Mass Destruction.
[36] Shilling, E. and Adams, J. R., 'Russia Is Evading Agreement On Poison Gas, General Warns', *Forward*, 2 February, 1996.

agricultural research system found on the International Centre for Agricultural Research in the Dry Areas (ICARDA) homepage.[37] However, one Syrian research institute working in the ecological area, the Environmental and Scientific Research Center (ESRC), was founded in Damascus 1994, according to the report. Again, a search in the major scientific databases does not reveal any publications from the ESRC. If this is the mentioned "ecological center" is uncertain and the lack of published reports from the ESRC, which is said to have 116 staff members in 1999, could of course be explained by assuming that the research centre focuses on applied science and in solving practical ecological/environmental problems.[38] However, it is remarkable that an institute of this size does not leave any footprints in the scientific literature.

One further indication to the ESRC in fact being the Russian-Syrian joint venture institute mentioned by Mirzayanov is that General Kuntsevich is present along with some Syrian authors on a Russian patent application in 1993, concerning production of activated coal.[39] One of the Syrian names on this patent, transliterated to Salekh Makhmut, corresponds to the name of the director of the ESRC, Mahmoud Saleh Soliman. Interestingly, the other Syrian name on the patent application is Mustafa Tlas, also being the name of the Syrian Minister of Defense. The two Syrian authors are also present along with General Kuntsevich on a research paper in1992.[40]

It should be noted that it is not possible to pinpoint ESRC as the product of a joint venture by former Soviet chemical weapons experts and Syria from the material available to the authors of this report.

Relevant Industry

Pharmaceutical Industries

The Syrian pharmaceutical industry has expanded rapidly since 1988 and provides between 85 -100% of the country's need for pharmaceutical products. The state organisation "Saydalaya" has a monopoly on the importation of drugs not produced in Syria. Syrian companies may apply for a license to manufacture a drug that is being imported. Tameco is the only non-private manufacturer of medicines in the country. In 2001, the company, employing approx. 1300 staff and produced a range of over 100 different products.[41] Apart from Tameco, there are 53 privately owned manufacturers of medicine in the country. In 2001, these 54 companies produced 1315 types of medicine.[42]

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[37] 'The National Agricultural Research System of Syria'
URL <http://www.icarda.cgiar.org/NARS/Syria.pdf>

[38] One report from ESRC that hints in this derection is found on the The EURO-ARAB 2004 environment conference homepage: Meslmani Y. and Soliman M. S., 'View of Air pollution problem in Damascus', URL <http://www.euro-arab.com/index_eng.html?studies/english/climate/02-0013/02-0013-1.html>

[39] Limonov, N. V. *et. al,* 'Method for production of activated coal', Pat. nr. RU2104925, 20 February, 1998 (application date 30 July 1993).

[40] Tlas, M., Kuntsevich, A. D., Polyakov, N. S., Mahmud, S. and Tarasevich, Yu. I. (1992) Adsorption properties of palygorskite-montmorillonite clays, *Zh. Fiz. Chem.* 66:1593-6. (In Russian).

[41] The Syria Report, 3 December, 2001

[42] The Syria Report, 9 March, 2002.

Exports of pharmaceutical products mainly go to countries in the Middle East and North Africa. Foreign companies may also outsource production to Syrian companies having the proper standard for their production facilities. According to Syria's Health Minister, Syria currently exports pharmaceutical products to 31 countries and 33 of its laboratories have received ISO certification.[43] According to the home pages of some Syrian pharmaceutical companies, they have licenses from foreign pharmaceutical companies to produce and market their products under the brand name. For instance, leading Western firms have licensed products for Syrian production (e.g., Bristol Myers/Squibb and Eli Lilly). [44] Oubari & Co in Aleppo is another example of a pharmaceutical company in Syria having been built with foreign aid. The company has a factory which started production in 2001, after passing all the required validations and qualifications for GMP regulations. The facility is a US$ 40 million investment with state of the art technologies imported from Germany, Italy, France and the U.S., from companies such as Bausch & Stroebel, Fette, Glatt., Diosna, Romaco, Brevetti, Munters, MG2, Stilmas and GIC.[45]

In conclusion, Syria appears to have a fairly well developed pharmaceutical industry with quite a few companies having GMP standards and even licenses to produce/formulate/package products of several large Western pharmaceutical companies. It has not been possible to establish whether the Syrian companies are performing the *de novo* production of the products or if they just are packaging or formulating products received from elsewhere. This fact also makes it difficult to estimate possible production capacities for biological substances. Assuming that at least some of the 54 companies have real production capacities, e. g. fermenters, and also storage capacity, it must be concluded that Syria has the potential to produce micro organisms or toxins in large amounts should an offensive BW-program become active in the country.

Chemical Industry

Syria is actively working on refining its natural assets. The Syrian Petroleum Company (SPC) was established in 1958 for the exploration of the oil resources in the country.[46] A first major chemical industry, an oil refinery, was opened in Hama 1959 and a second refinery has been opened in Banias. In 2001, the oil and gas industry accounted for nearly three-quarters of Syria's total export and one-third of its GDP.[47]

In addition to the petroleum industry Syria is also a producer of phosphate, for example as fertilisers, nitrogen containing products and sulphur. Syria is however still a net importer of fertilisers but is actively trying to be self-sufficient. Syria also continues to expand its chemical industry in other

[43] The Syria Report 26 July, 2002

[44] ALPHA, Aleppo Pharmaceutical Industries, Syria, URL <http://www.alpha-syria.com/company.html>

[45] Oubari & Co, Syria, URL <http://www.oubari.com/new/company.html>

[46] The Ministry of petroleum, electricity and Mineral Resources, URL<http://www.mopmr-sy.org>

[47] Yager, Thomas, R., "The Mineral Industry of Jordan, Lebanon and Syria", U.S. Geological Survey Minerals Yearbook 2001, URL<http://minerals.usgs.gov/minerals/pubs/country/2001/jolesymyb01.pdf>

sectors. One recent project is the construction of a chlor-alkali plant in Aleppo in cooperation with Saudi interests. The facility will have an annual production capacity of 24,300 tons of caustic soda, 8,800 tons of chlorine, 141,000 tons of hydro-chloric acid and 12,300 tons of sodium hydrochloride.[48] Another project that has been reported is a fertiliser plant financed by Spanish investors.[49]

It can be argued that an established petroleum industry, in combination with phosphate and sulphur industries may yield a number of the most important precursor chemicals needed for the production of nerve agents and other CW agents. Despite this situation, it is still believed that Syria is dependent on import of some key chemicals, as well as production equipment, for parts of their CW-program.[50] It should be noted that procurement of precursors and technology related to weapons of mass destruction has become more difficult during the last decades. The emergence of export control regimes has forced a state seeking chemical weapons capabilities, and/or other types of weapons of mass destruction, to develop their own national scientific and industrial infrastructure.[51] A developed national (chemical) industry also legitimate needs for import of substances and technology, which later can be diverted to use in the production of chemical weapons.

International collaborations and projects

International collaborations in the Field of Health

Syria has established cooperation with other countries within the field of health care and medical technology. In 2002, Iran declared its willingness to cooperate with Syria within the medical field including a promise that Iran will provide Syria with the latest medical technology. In 2003, Syria and Cuba signed an executive program regarding cooperation within the health field. This could be seen as an implementation of a cooperation agreement signed in 1998 regarding the cooperation in exchanging information on contagious and environmental disease and on ways of combating such diseases. The program provides the exchanging of experts in the field of prevention and medicine, medication and exchanging medicaments. Syria has also signed agreements with the World Health Organisation (WHO) regarding cooperation in establishing a national system for fighting brucellosis in Syria.

Cooperation with India

In 1990, a cooperation program was initiated between Syria and India, the active partners being the Council of Scientific and Industrial Research (CSIR) in India and the Scientific Studies and Research Centre (SSRC) in Syria. This cooperation has been reviewed and updated a couple of times. The HIAST is

[48] Annual Report 1422 H (2001 – 2002), General Assembly of the Islamic Corporation for the Development of the Private Sector,
URL<http://www.icd-idb.com/web%20site_files/English%20Ann%20Rpt.pdf>

[49] Spanish company to invest into an organic fertilizers plant, The Syria Report, 1 April, 2002.

[50] See, for example: CIA, Unclassified Report to Congress on the Acquisition of Technology Relating to Weapons of Mass Destruction and Advanced Conventional Munitions, 1 January Through 30 June 2003,
10 November, 2003, URL<http://www.cia.gov/cia/reports/721_reports/jan_jun2003.htm>

[51] The mayor export control regime that deals with technology related to biological and chemical weapons is the "Australia Group". See URL<http://www.australiagroup.net/> for further information.

one of the Syrian institutes involved. According to the initial protocol[52], the cooperation between the CSIR and the SSRC includes:

- Exchange of Scientists, research scholars and specialists etc. for the purpose of research, training, consultation and exchange of experience.

- Setting up of joint ventures, joint laboratories or pilot stations for research and development activities.

Several areas of cooperation have been identified, for example within the chemical and biological fields:

- A multi-purpose pilot plant for the production of chemical organic intermediates.

- Training in chemical engineering focusing on pilot plant design and operation, chemical process design, and application of computers in pilot plants.

- Training in microbiological techniques and in microencapsulation techniques for insecticides and pharmaceuticals.

The updating taken place in 1996 concluded that progress had been notable, especially in the secondment of CSIR scientists to Syria; training of Syrian scientists in India; and in technology transfer. This also resulted in new identified areas for training researchers from SSRC in India on molecular biology techniques including tissue culture techniques for diagnostic virology; preparation of viral serologic antigens in tissue cultures; use of tissue culture for toxin detection, Immunochemistry and Pharma-technology. Also, training in basic toxicology, experimental acute and chronic toxicology and environmental inhalation toxicity was performed.

Recently, on November 15 2003, India signed a joint working plan with Syria for bilateral cooperation within the field of biotechnology.[53] The joint research plan includes a US$ 1 million grant for the development of Syria's National Biotechnology Centre, a centre inaugurated by the Indian Prime Minister Vajpayee. Vajpayee also made an official statement in which he stated that the centre symbolises the transition of Indo-Syrian relations from its traditional roots to contemporary age.

[52] Protocol for Scientific and Technical Cooperation between the Council of Scientific and Industrial Research, India and the Scientific Studies and Research Centre, Syria, 1996,
URL <http://www.csirwebistad.org/pdf/opp38.pdf>

[53] CIOL network, Biospectrum, 11 December, 2003,
URL <http://www.biospectrumindia.com/content/news/103121101.asp>

Participation in IAEA Technical Co-Operation Projects

National IAEA Projects

Since 1974, the IAEA through its Department of Technical Co-Operation has assisted Syria in 58 predominantly nuclear-related research projects. In return, Syria has conscientiously fulfilled its financial obligations towards the IAEA. Of the 58 Syrian projects, 45 have up until now been completed. The IAEA has assigned the same project assistant officer to all the thirteen projects that are currently active: Fathi Abdel Rouf El-Khangi. It appears to be normal procedure for the IAEA Technical Co-operation Programme to have as few country project officers as possible.

We have made an effort to categorise the 58 Syrian IAEA projects;
Agriculture (14)
Medicine; diagnostic tools, radiopharmaceuticals and sterilisation (11)
Hydrology and water management (4)
Neutron and reactor techniques associated with MNSR (4)
Uranium exploration and recovery (4)
Administration and feasibility studies (3)
Environmental monitoring (3)
Neutron activation analysis (3)
Radiation and nuclear safety (3)
Development of nuclear energy (2)
Electronics (2)
Waste management and quality assurance (2)
Education (1)
Materials development (1)
Neutron dosimetry (1)

In 2002, the 13 active projects received about US$ 1.2 million in support from the IAEA.

Regional IAEA Projects

Syria belongs to the West Asia region of the IAEA Technical Co-operation Programme. The IAEA defines this region as the classical definition of the Middle East excluding Egypt, the five Central Asian states that were former U.S.S.R. republics, and Afghanistan. The IAEA are currently pursuing 19 regional projects in West Asia. Shamim Ahmed Chaudhri is the project officer responsible for ten of these projects, Mehdi Sohrabi is managing seven, and Fathi Abdel Rouf El-Khangi two of them. Syria participates in 13 of the 19 projects and is, along with Jordan (18), Yemen (16), Kazakhstan (14), and Iran (12), one of the most active states in the region. The regional projects represent approx. 30% of the total budget for West Asia, or approx. US$ 3 million. The Agency's costs for individual country projects were approx. US$ 7 million. Iran (US$1.8 million) is the main beneficiary in the region followed by Syria (US$ 1.2 million).

Interregional IAEA Projects
Syria also participates in four of the IAEA's 23 interregional projects, the four topics being entomology (the use of sterile insect technique), irrigation using saline water, laboratory proficiency, and project administrative assistance. Starting in 2000, one-year postgraduate training courses in Arabic on radiation protection and the safety of radiation sources, have been held at the Higher Institute of Applied Sciences and Technology in Damascus. Around 100 students from about ten states have taken part in this course up until today. In 2002, another IAEA-sponsored course concentrated on safety of radioactive waste management.

To improve nationally produced phosphoric acid, the UN Development Program (UNDP) has assisted Syria in a five-year project worth US$ 2.3 Million. The IAEA has been involved in this project to help setting up techniques for the removal, but also for the recovery of uranium from the acid. In 1995, a 370 TBq Co-60 source was delivered to Syria to be of use in studies on seed mutation, the sterile insect technique (SIT), and sterilisation of medical goods.[54]

[54] IAEA, Technical Co-Operation Report For 1995 - Report By The Director General, GC(40)/INF/3 (1996).

Appendix 3: Multilateral Disarmament Ambitions

On the diplomatic arena, several states in the Middle East region have strived for multilateral agreements regarding the possession of WMD. As early as in 1962, an Israeli action group "the Committee for Denuclearisation of the Arab-Israel Conflict" proposed the establishing of a nuclear-free zone in the Middle East.[55] The Israeli Government rejected the proposal and settled instead for the deliberately ambiguous statement it still maintains.

Nuclear Weapons Free Zone Initiative

In 1974, a nuclear-weapons-free zone in the Middle East was first discussed in the United Nations. The zone was jointly proposed by Iran and Egypt. It called for the states of the region to refrain from producing, acquiring, or processing nuclear weapons. Furthermore, it called for the nuclear weapons states not to introduce their nuclear weapons into the zone and the establishment of an effective international safeguards regime.

All nuclear weapons states voted for the draft resolution when it came up for vote on December 4, 1974. With two abstentions (Israel and Burma), the resolution was adopted with 128 votes for, none against. In 1975, when the Secretary General asked the states in the region in what way the draft resolution should be implemented, a stalemate soon developed. The Arab states were ready to undertake their commitment to the resolution provided Israel acceded to the NPT and equally fulfilled the commitment to the draft resolution.

The stalemate has persevered for almost three decades despite efforts to break it. There have been some notable developments in this period like for example the 1979 Iranian Revolution, the 1981 Israeli raid against the Iraqi nuclear reactor Osiraq, and the 1991 Gulf War.

WMD-Free Zone Proposal

Only four months prior to the Iraqi invasion of Kuwait in 1990, President Mubarak of Egypt submitted a proposal to the UN calling for a zone free of weapons of mass destruction in the Middle East.[56] This initiative was met with scepticism in the Arab world and Saddam Hussein objected outright to the proposal at the Arab Summit Meeting in Baghdad, in June the same year. The main criticism was that it would allow Israel, the sole nuclear weapons state in the region, to shift focus away from nuclear weapons.

By 1994, both Syria and Saudi Arabia adhered to the Egyptian proposal for widening the concept of the zone, despite criticism.

During the years 2002 and 2003, when Syria held the Asia regional group UN Security Council seat; it repeated the call for a weapons-of-mass-destruction-free-zone in the Middle East. The draft resolution to the UN Security Council, calling for a Middle East region free of all weapons of mass destruction,

[55] Pande, Savita. 'Nuclear Weapon-Free Zone in the Middle East', *Strategic Analysis*, 22:1369-1379 (1998).

[56] Conference on Disarmament, paper 989. 20 April, 1990.

especially nuclear ones, was presented by Syria on April 16, 2003.[57] The draft, being backed by the 22-nation Arab Group, came during a time of increasing U.S. pressure and only two days after George W. Bush having accused Syria of possessing chemical weapons and of harbouring Saddam regime officials. The Syrian regime was thus trying to alleviate the increasing pressure by putting some of the focus on Israel and its alleged arsenal of nuclear weapons. The resolution was met with doubts by the U.S. and the other Security Council members at a time when the ongoing mission to disclose the expected arsenal of WMD in Iraq was of primary concern. Shortly before leaving the Security Council, on December 29, 2003, Syria once more called for a discussion of the draft resolution in the Security Council. The Syrian message stating that there exists a double-standard policy for the Middle East since Israel is allowed to hold weapons of mass destruction, and the Arab states are not, was once more repeated. The UN Security Council met and discussed the draft resolution on December 30, 2003, but refrained from public statements regarding the meeting.[58]

Chemical and Biological Disarmament

Syria acceded the 1925 Geneva Protocol in 1968 and did not reserve the right of retaliation. The country has signed but not ratified the Biological and Toxin Weapons Convention. Syria is not a member of, or a signatory state to, the Chemical Weapons Convention (CWC).[59] The decision not to join the CWC and the BTWC has to be viewed in the context of the Israeli non-conventional threat to Syria. Several Arab countries, for example Egypt, Lebanon and Iraq, have a policy linking their adherence to the CWC with Israel becoming a party to the NPT and the realisation of a WMD-free zone in the Middle East.

At the conference held in Paris in 1989, aiming at reaffirming the 1925 Geneva Protocol, the Syrian Foreign Minister Faruq al-Shar'a stated that Syria was of the opinion “that the call for eliminating and destroying chemical weapons must be coupled with a parallel call for eliminating and destroying the other weapons of total destruction”.[60] Furthermore he called for the construction of a zone free of all WMD in the Middle East and stated that the Israeli possession of “weapons of mass destruction, chemical and nuclear” was a severe threat to the region.

Nuclear Disarmament

When the Non-Proliferation Treaty (NPT) was opened for signature in 1968, Syria was one of the states to immediately sign the treaty. On September 24 the same year, it became only the second state to ratify the NPT. However, the ratification had the following addition: “The acceptance of this Treaty by the Syrian Arab Republic and the ratification thereof by the Government of the Syrian Arab Republic shall in no way signify recognition of Israel or entail entry into relations with Israel thereunder”. Out of the other Arabic states, only

[57] ‘Syria proposes Mideast free of WMD’, *CNN*, 17 April, 2003.
[58] Arieff, I., ‘UN Council to weigh nuclear arms ban in Middle East’, *Reuters*, 26 December, 2003.
[59] As of April 30, 2004 there are 162 State Parties to the CWC. For further information see the web site of The Organisation for the Prohibition of Chemical Weapons, URL <http://www.opcw.org>
[60] ‘Syrian Foreign Minister addresses Paris Conference on Chemical Weapons’, *Damascus home service*, 9 January, 1989, (via BBC Summary of World Broadcasts, 11 January, 1989).

the ratifications of Bahrain and Kuwait in 1988 and 1989 have additions of similar wording. Oman was the last Arabic Middle East state to ratify the NPT in 1997. Today, Israel, along with India, Pakistan and North Korea, are the only states outside this, the most widely ratified, international treaty.

In 1996, the Comprehensive Test Ban Treaty (CTBT), was opened for signature. Syria is currently one of 23 states not having signed the treaty. There are only a few states in the Middle East region that have both signed and ratified the CTBT. None of the other major players in the region; Egypt, Israel, Iran, and Saudi Arabia have ratified the CTBT.

Syria has not signed the Additional Protocol to the IAEA Safeguards. The Syrian position is that as long as Israel has not signed or ratified the NPT, and allowed full-scope safeguarding of all their nuclear facilities (i.e. also at Dimona), it will not be signing the Additional Protocol.

Appendix 4: Syrian Ballistic Missile Development

Assistance from the Soviet Union

FROG-7 and Scud B

In the beginning of the 1970s, Damascus did not have the ballistic arsenal it possesses today, but the realisation of their advantages became evident after the war in 1973. In the Yom Kippur War, Syria lacked Scud B capability and a strong air defence, which could have targeted Israeli population clusters, and was thus unable to deter or retaliate Israeli attacks. The first missiles acquired by Syria were the FROG-7 (Free Rocket over Ground), having a range of 70 km and a 500-700m CEP, bought from the Soviet Union in 1972. The FROG-7's poor range and CEP gave Syria the disadvantage of forward deployment in order to reach Israeli targets, which became evident in 1973. The FROG-7 was used in the 1973 Arab-Israeli conflict when Syria launched several missiles at the Ramat David Air Base in the Northern part of Israel. Even though the missiles were deployed only 3000 meters from the Israeli boarder, almost all missed their targets.[61] Due to the poor performance of the FROG-7, Syria requested, from Moscow, more advanced missiles with better accuracy. As a result, in 1974, the Soviet Union supplied Syria with Scud B having a range of about 300 km and a 450m CEP. However, the short range and wide CEP did not improve Syrian strategic capability towards Israel, and when Syria was defeated by Israel in Lebanon 1982, Damascus held Soviet missile technology responsible.

SS-21

As a consequence, the Soviet Union agreed to supply Syria with SS-21s, ranging 70 to 120 km depending on the model, but with a more accurate 30 – 160 m CEP. The SS-21s reached Syria in October 1983, and was "assumed to be intended for use against military bases and forces in northern Israel."[62] As from 1984 to 1989, Syria tried to purchase additional SS-21s and the more advanced SS-23. With the SS-23, having a range of 500 km, Syria would have been able to strike targets throughout Israel and Jordan, and also in much of Iraq. However, when the Soviet Union signed the INF (Intermediate Nuclear Forces) treaty in December 1988, the SS-23 was to be eliminated and proliferation prohibited, hence the Syrian request was denied. Syria sought additional SS-21s, but the problem with the SS-21 was that even though it had a low CEP, it did not however "have the range to hit Dimona and most suspected nuclear weapons and missile storage sites,"[63] thus the Syrian need for longer-range missiles continued. Damascus then turned to China and North Korea for assistance, and the two nations would become vital in the further development of the Syrian ballistic missile program.

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[61] "Syrian Missile Development," *The Risk Report.* Volume 3 Number 2 (March-April 1997). URL<www.wisconsinproject.org/countires/syria/missiles.html>

[62] "Perspectives-Ballistic Missile Proliferation," *Canadian Security Intelligence Service,* URL<www.csis-scrs.gc.ca/eng/misdocs/200009_e.html>

[63] Cordesman, Anthony H., "Syria and Weapons of Mass Destruction," *Centre for Strategic and International Studies*. October 2000. p.2.

Chinese Assistance

M-9

When Syria was turned down by the Soviet Union, Damascus turned to China in 1989 for assistance to attain longer-ranging missiles. Damascus was especially interested in the M-9 having a range of 600 km and a CEP ranging 280 - 600 meters, to increase its military capability and deterrence. According to the CIA, an agreement was signed between Syria and China in 1989 for the sale of 30 M-9 launchers and an unknown number of missiles to a cost of US$ 285 million.[64] China's relations with Syria has for a long time been a concern to the United States in regards to non-proliferation regarding Beijing's "proposed sale of Chinese M-9 missiles and technology."[65] In August 1991, China had delivered at least 24 M-9 launchers to Syria, and the missiles were expected to follow, even though the Chinese government denied any sales to Damascus. Reports vary, in regards to an actual delivery of M-9 missiles to Syria, but there is no doubt that Beijing has given much assistance to the Syrian missile program. In 1993 China "provided Syria with production technologies and materials for the indigenous manufacture of ballistic missiles, including an indigenously produced version of the Chinese M-9."[66] In 1996, US sources reported that the China Precision Machinery Import-Export Corporation shipped missile-related technology to Syria's Scientific Studies and Research Centre (SSRC,)[67] "which oversees Syria's ballistic missile, weapons of mass destruction (WMD,) and advanced weapons research and development."[68]

Ever since the 1990s, China also assists Syria, in cooperation with North Korea, in developing two missile production centres, and Syrian scientists specialising in missile technology have reportedly been sent to Beijing for training.[69] In 1997, China assisted Damascus in the modernisation of its Scud B arsenal, and in cooperation with North Korea and Iran, constructed underground facilities for the production of Scud C and M-9 at Aleppo, which houses the Syrian missile command, and in Hama.[70] Fifteen such underground facilities, having hardened silos and a deep network of tunnels, have been built for more than 1000 Scud C missiles. Syria's Scud missiles are used as strategic deterrent and thus need to be concealed in tunnels to protect them from an eventual Israeli or other hostile nation's pre-emptive strikes.

[64] "China's Missile Exports and Assistance to Syria," *Centre for Nonproliferation Studies,* URL<http://www.nti.org/db/china/msyrpos.htm>
[65] Ibid.
[66] Ibid.
[67] Ibid.
[68] China's Missile Exports and Assistance to Syria," *Centre for Nonproliferation Studies,* URL<http://www.nti.org/db/china/msyrpos.htm>
[69] Kozyulin, Vladim,"Syria's Missile Deterrent: Final Breakthrough?" *PIR Arms Control Letters,* October 2000. URL<www.pircenter.org/board/article.php3?artid=434>
[70] Ibid.

North Korean Assistance

Scud C and D

According to Israeli intelligence, negotiations were held between Syria and North Korea in late 1989 regarding missiles that could compensate for the Soviet rejection of SS-23, but due to Syrian lack of hard currency, a deal was not finalised until 1991 when Syria received US$ 2–3 billions[71] in aid from the Saudi Arabia and other Gulf states as a compensation for its participation in the coalition against Iraq in the 1991 Gulf War.[72] In 1991, Damascus concluded the deal with Pyongyang and received three deliveries up to a total of 24 Scud C missiles, ranging 550 – 700 km with a 50 – 700 meter CEP, and 20 launchers. In 1992, shipments to Syria were routed through Iran following U.S. protests, and then airlifted into Damascus. The first Scud-C test was performed in July 1992, in the presence of North Korean observers. Since 1992, "up to 50-80 missiles and 15-20 launchers have been delivered and manufactured with the assistance of North Korea, and several Syrian tests of the [Scud C] missile have taken place."[73] In 1994, Pyongyang also delivered Scud-C cluster warheads to Damascus. In 1997, several additional missile tests of the North Korean Scud C were carried out, and it is "believed that all these tests were intended to verify missile reliability and to train Syrian missile troops."[74] The cooperation between Damascus and Pyongyang continued throughout the 1990s, and in 1996, Syrian missile technicians reportedly spent two weeks in North Korea.

In 2000, North Korea allegedly supplied Syria with a number of Scud-D (in North Korea referred to as No-dong 1 or Hwasong 7) ranging 1000-1500 km and with a 50 – 190 meter CEP which were tested in September the same year.[75] Scud D is one of North Koreas most advanced technological achievements, and the deployment of these missiles to Syria came as a surprise to Israel. The Scud D gives Syria the possibility of reaching Israeli targets from deep inside Syrian territory, making them less vulnerable to pre-emptive strikes as if deployed close to the boarder. Four tunnels have been constructed to house Scud D missiles which are the longest ranging missiles in the Syrian arsenal.[76] The range of Scud C, which is in use, gives Damascus the advantage of being able to initiate an assault from anywhere in Syria, making it more difficult for Israel to find the launch locations thus enhancing the missiles survival rate. The same can be said of Scud D when deployed. However, the extended warning time, due to the extensive distance of the fire range, gives Tel Aviv a greater chance to implement defensive measures.[77]

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[71] The number of the amount received ranges from about 1 to 3 billion U.S. dollars.

[72] "Syrian Missile Development," *The Risk Report.* Volume 3 Number 2 (March-April 1997). URL<www.wisconsinproject.org/countires/syria/missiles.html>

[73] Cordesman, Anthony H. *Peace and War: The Arab-Israeli Military Balance Enters the 21st Century.* (Westport: Praeger Publishers, 2002) p. 541.

[74] Bermudez Jr, Joseph S. "A History of Ballistic Missile Development in the DPRK," *Centre for Non-Proliferation Studies.* Monterey Institute of International Studies. Occasional Paper No.2. November 1999.

[75] Ibid.

[76] See "Syria," *The Wednesday Report: Canada's Aerospace and Defence Weekly.* URL<www.mobrien.com/twr/syria/syria.htm>

[77] Eisenstadt, Michael. "Arming for Peace? Syria's Elusive Quest for Strategic Parity," *The Washington Institute Policy Papers.* No.31, 1992, p.53.

An additional threat to Israel is that all Syrian Scuds are designed to carry conventional warheads as well as biological and chemical ones. As a result, Israel has, with the assistance of the United States, developed and deployed a missile defence system called “Arrow” to counter Syrian and other Arab nation’s forward missile deployment and offensive posture.

Iranian Assistance

Scud C (Shehab-2)

In addition to Soviet, Chinese and North Korean assistance, Iran has been involved in the development of the Syrian ballistic missile program. In September 1991, when Iran had concluded an agreement with North Korea for the purchasing of Scud C (in Iran called Shehab-2,) reports emerged of a Syria/Iran accord to jointly produce Scud C. Iran would finance the Syrian project worth US$ 250 million; North Korea and China would assist in the construction of the factories in Aleppo and Hama, and in addition provide equipment and technology needed for the project.[78] According to U.S. officials, these factories have “contributed to Syria’s drive for self-sufficiency in the production of such missiles as Scud C and Scud D.”[79] Under the agreement between Iran, North Korea and Syria, Iran has functioned “as an intermediary, transhipping an estimated US$ 100 millions worth of missile, components, and technology to Syria by air that it received by sea from [North Korea.]”[80] In 1994, Iranian specialists were allegedly present when Syria tested a Scud C, and the collaboration between Teheran and Damascus has most likely continued in regards to the production of Scud C, and also in the further development of missile technology of Scud D received from North Korea.

[78] ”Missile Capabilities: Shehab-2 (Hwasong-6, Scud-C,)” URL<www.nit.org/e_research/profiles/Iran/Missile/3367_3394.html>

[79] ”DIA: Iran exporting missiles to Syria,” *World Tribune.Com* URL<http://216.26.163.62/2002/me_iran_03_21.html>

[80] ”Missile Capabilities: Shehab-2 (Hwasong-6, Scud-C,)” URL<www.nit.org/e_research/profiles/Iran/Missile/3367_3394.html>