

Hamburg Centre
for Biological Arms Control



Transparency in past offensive biological weapon programmes

An analysis of Confidence Building Measure Form F
1992-2003

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Occasional Paper No. 1
June 2006

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EXECUTIVE SUMMARY

The lifesciences are a field in which dual use material, equipment and knowledge play an extremely important role. In order to generate confidence that activities in this field are carried out for peaceful purposes, the will to provide information on these activities is very important. In other words, the key mechanism to avoid that dual use activities are misconstrued is transparency. There are very few transparency enhancement mechanisms in the area of biological arms control and the most important thus far, are the Confidence Building Measures (CBMs). Since their inception, CBMs have suffered from weak participation and mixed quality. Almost half of the States Parties have never submitted a CBM report. In terms of quality, submissions have been plagued with inaccuracies and omissions. While on the one hand, any CBM submission can be seen as a commitment to the Biological Weapons Convention (BWC), in order for there to be an increasing degree of transparency and ultimately confidence in compliance, CBMs need to be accurate, complete, submitted regularly and they must address the relevant topics.

This paper analyses information provided in CBM Form F and assesses its accuracy and completeness. CBM Form F requests information on past offensive and defensive biological research and development programmes. The focus of this paper is on past offensive activities.

Until 2003, six countries had submitted information on past offensive biological weapons (BW) programmes using the CBM Form F: Canada, France, Iraq, Russia, United Kingdom and USA. South Africa, which has also formally acknowledged a government sponsored BW programme, did not declare its existence with the CBM. The table below summarizes the level of transparency provided for different activities in the past offensive BW programmes of states.

Activity	Canada	France	Iraq	Russia	South Africa	United Kingdom	USA
Administration							
Research							
Development							
Testing							
Production	*						
Stockpiling	*						
Military doctrine							
Conversion							
Black boxes – No transparency; information on the particular activity is missing or appears contradictory to open sources. Grey boxes – Medium level of transparency; the particular activity is mentioned as having taken place (or not taken place), but no detail is provided or important detail is missing. White boxes – High level of transparency; detailed information on the particular activity is provided. * Production and stockpiling in Canada are afforded the highest level of transparency because neither has occurred.							

As the table shows, there is not necessarily a correlation between a consistent, longstanding and active support for the BWC and a high level of transparency in regard to past activities. Providing

only a limited level of transparency or no transparency at all undermines the CBM mechanism and puts into question the commitment of the State towards the goals of the BWC.

For the CBMs to function efficiently, all BWC member states have to participate regularly and submission quality has to be improved. One way to help improve the quality of submissions is to assess and if necessary revise the individual CBM Forms. After a careful assessment of the descriptions of offensive activities, summarised and analysed in this paper, the following recommendations for the improvement of CBM Form F can be made:

- Encourage new submissions
- Maintain open-answer format
- Cover all aspects of the past BW programme
- Promote updates
- Encourage discussion

It is clear that CBMs will play an increasingly vital role in biological arms control as no other transparency mechanism is likely to emerge soon. The Sixth BWC Review Conference at the end of 2006 represents an opportunity to make intelligent changes to the CBM regime in order to transform it into an efficiently working component of the biological arms control system.

1. INTRODUCTION

The lifesciences are a field in which dual use material, equipment and knowledge play an extremely important role. In order to generate confidence that activities in this field are carried out for peaceful purposes, the will to provide information on these activities is very important. In other words, the key mechanism to avoid that dual use activities are misconstrued is transparency. Transparency refers to the availability of relevant information and to the openness of a system to external observers. It serves mainly two purposes: first it deters violations of norms, and second it reassures actors that others are not misusing technologies and goods.¹

Preventing the misuse of modern biotechnology for the production of biological weapons (BW) is one of the primary aims of transparency in the biological sciences. The Biological Weapons Convention (BWC) does not currently provide this transparency, although there are instruments in place which seek to develop a transparent climate. The most important transparency enhancing mechanism in the BWC are the Confidence Building Measures (CBMs). CBMs, as part of the BWC, were first discussed in 1986, and later expanded in 1991. They currently take the form of annual declarations on relevant national activities in the biological field. However, since their inception, they have suffered from weak participation and mixed quality. Just below half of the States Parties have never submitted a CBM report and in terms of quality, submissions have been plagued with inaccuracies and omissions.² While on the one hand, any CBM submission can be seen as a demonstration of support for the BWC, in order for there to be an increasing degree of transparency and ultimately confidence in compliance, submissions need to be accurate, complete, submitted regularly and they must address the relevant topics. Evaluations of the CBMs are rare. A recent analysis³ focuses on the information submitted in CBM Form A1 (BL4 facilities), A2 (current biodefence programmes) and G (vaccine production facilities), but provides no evaluation of the accuracy and completeness of the information submitted.

This paper analyses information provided in CBM Form F and assesses its accuracy and completeness. CBM Form F requests information on past offensive and defensive biological research and development programmes. The focus of this paper will be on declarations covering past offensive activities which the CBM describes as “production, test and evaluation, weaponization, stockpiling of biological agents, the destruction programme of such agents and weapons and other related research”. The box below shows the actual CBM Form F. Given its open-ended answer format, CBM Form F provides an ideal opportunity for analysis. The declaration reflects the degree of transparency the submitting country is willing to provide.

¹ Florini, A. (1998): A New Role for Transparency, in: Nancy Gallagher (ed.): Arms Control. New Approaches to Theory and Policy, Frank Cass: London, Portland, pp 51-72.

² Hunger, I. (2005): Confidence Building Needs Transparency. A Summary of Data Submitted under the Bioweapons Convention’s Confidence Building Measures 1987-2003, September 2005, The Sunshine Project. Available at http://www.biological-arms-control.org/download/hunger_CBM.pdf.

³ Ibid.

Form F

Declaration of past activities in offensive and/or defensive biological research and development programmes

1. Date of entry into force of the Convention for the State party.
2. Past offensive biological research and development programmes:
 - YES - NO
 - Period(s) of activities
 - Summary of the research and development activities indicating whether work was performed concerning production, test and evaluation, weaponization, stockpiling of biological agents, the destruction programme of such agents and weapons, and other related research.
3. Past defensive biological research and development programmes:
 - YES - NO
 - Period(s) of activities
 - Summary of the research and development activities indicating whether or not work was conducted in the following areas: prophylaxis, studies on pathogenicity and virulence, diagnostic techniques, aerobiology, detection, treatment, toxinology, physical protection, decontamination, and other related research, with location if possible.

This paper focuses solely on past offensive BW programmes. There are three reasons for this focus. Firstly, providing sufficient information on past activities is necessary as a basis of trust building. Secrecy about the past, even when current activities are transparent, will always leave a seed of mistrust. Numerous truth commissions are proof of the fact that a controversial past has to be dealt with before trusting relationships can be established. Secondly, BW programmes produce, in addition to the weapons themselves, knowledge and materials that, if in the wrong hands, constitute a threat even after the programmes have ended. Thirdly, Article II of the BWC requires states to convert or destroy all weapon related biological material within nine months of the treaty coming into force. Information on destruction or conversion builds confidence that the past programme has indeed been ended and the immediate threat no longer exists.

This paper performs three tasks. Firstly, it presents the information on past offensive BW programmes declared in the most recent complete CBM Form F submission. All CBM Form F submissions from 1992 (when information on past programmes was required for the first time) until 2003 (the last year a complete collection of CBM submissions was available to the

researcher), for both offensive and defensive sections, were analysed.⁴ The table in Annex II indicates for each CBM submitting BWC State Party whether information on past programmes was provided for each of the twelve years.

A problem which arises in the analysis of CBM Form F is that only the submitting country will know the true intentions – offensive or defensive – of particular avenues of research. Therefore, some activities that one might expect to find in the description of the offensive programme, such as open air dispersion trials, are declared under the defensive programme. As far as possible, only activities that were declared as being part of the offensive efforts of a state are considered in this paper. It was necessary, however, to review all of the information submitted in order to get an idea of how and why particular activities were classified as defensive or offensive.

Secondly, this paper evaluates the completeness and accuracy of the declared data by comparing it to open source material. In contrasting declared data with open sources a picture will emerge indicating how open countries have been with regards to their past offensive activities and the amount of effort that was put into compiling data for the CBM submission. It is clear that absolute complementarity is unlikely. However, gross omissions, inconsistencies or lack of detail will be apparent. This paper does not seek to provide answers as to why particular information might be missing.

With the exception of Iraq, the open source information used for evaluating the declared data is derived from Wheelis et al. 2006.⁵ This book analyses in detail known or suspected BW programmes after World War II and relies, where possible, on official declassified and unclassified government documents and expert interviews. In the case of Iraq, UNMOVIC's 22nd Quarterly Report from August 2005⁶ serves as the open source information against which the declared data was evaluated.

In order to maintain a standard framework for evaluating the completeness and accuracy of declared data, the paper will classify the declared information into seven categories of activities. These categories were identified by Stockholm International Peace Research Institute (SIPRI) as necessary activities in the development of a biowarfare capability: 1) administration, 2) research, 3) development, 4) field testing, 5) production, 6) stockpiling and 7) military doctrine.⁷ Additionally, an eighth category is included – conversion – because it is the logical end point of a BW programme and information of this type is already explicitly requested in CBM Form F.

The level of completeness and accuracy of the declared data and correspondingly the level of transparency in each of the eight categories of activities is evaluated using a 3-tiered scale as follows: 1) Information on the particular activity is missing or appears contradictory to open sources. This level indicates no transparency. 2) The particular activity is mentioned as having

⁴ For a list of documents containing the complete collection of CBMs from 1992 until 2003 see Annex I.

⁵ Wheelis M., Rózsa L., Dando M. (2006): *Deadly Cultures. Biological Weapons Since 1945*, Harvard University Press: Cambridge and London.

⁶ Twenty-second quarterly report on the activities of the United Nations Monitoring, Verification and Inspection Commission in accordance with paragraph 12 of Security Council resolution 1284 (1999), S/2005/545, August 30, 2005.

⁷ SIPRI (1971): *The Problem of Chemical and Biological Warfare*, Vol. V, *The Prevention of CBW*, Almqvist & Wiksell International, Stockholm and Humanities Press, New York. pp 141-144.

taken place (or not taken place), but no detail is provided or important detail is missing. This level indicates a medium level of transparency. 3) Detailed information on the particular activity is provided. This level indicates a high level of transparency.

Lastly, this paper provides recommendations on improving CBM Form F in order to increase transparency in past offensive BW programmes.

2. ANALYSIS AND EVALUATION OF DECLARED DATA ON PAST OFFENSIVE BW PROGRAMMES

Some countries have submitted several versions of CBM Form F over the years. This chapter presents the information provided in the latest complete version and evaluates the completeness and accuracy of the declared data. The analysis points out discrepancies and omissions and presents a general judgement on the level of transparency regarding past offensive activities. A total of six countries submitted information on past offensive BW programmes: Canada, France, Iraq, Russia, United Kingdom (UK) and USA. The analysis is restricted to those countries that provided information on past offensive programmes in the CBM or have officially declared the existence of a programme through other means, such as South Africa.⁸ It does not look at states with suspected BW programmes that have not provided relevant information.

2.1. CANADA

Year of last complete CBM Form F submission: 2002

Document containing last complete CBM Form F submission: DDA/BWC/2002/CBM

Declared period of past offensive BW programme: 1946-1956

Length of declaration: One quarter of a page

Submission history: Canada has submitted the same version of CBM Form F every year between 1992 and 2002.

Summary of information provided in the CBM

According to the Canadian CBM, areas of research were: improved production of toxins (botulinum and diphtheria); munitions testing including performance in cold weather; study of particle dispersion; examination of tissue culturing for the cultivation and production of viruses; improvement of particle preparation for munitions charging and toxin sampling; development of *Burkholderia mallei* and *Burkholderia pseudomallei* as BW agents; and the evaluation of the use of insects as vectors for pathogenic bacteria dispersal.

The CBM further states that Canada never undertook large scale production, stockpiling or weaponisation, and that no efforts were made to determine the efficiency of a particular agent as a weapon.

⁸ For the acknowledgement of South Africa's BW programme see South African Government Communications and Information System (GCIS) (1998): Statement on the TRC hearings on the CBW programme, 15 June 1998, Pretoria.

Evaluation of CBM information and comparison with open sources⁹

The short description provided by Canada reflects, perhaps, the small size of the programme. However, important details are missing. Canada has always been a strong advocate for biological arms control. Therefore it is surprising that the Canadian submission provides so little information and reflects such an obvious absence of effort.

Canada has been an ally of the USA and the UK since before World War II, and as an ally has relied on these countries to establish the necessary deterrence for Weapons of Mass Destruction (WMD). Unlike the UK and the USA, Canada abandoned efforts to develop an atomic weapon after the War and instead chose to focus on the development of biological and chemical weapons. Canada, therefore, put much effort into reinforcing biological defences and establishing a retaliatory capacity. Nevertheless, Ottawa almost always played a support role, engaging in some research and allowing access to testing grounds for US and British BW trials. The CBM states that Canada never engaged in production, stockpiling or weaponisation of any biological agent. However, it does not mention the degree of involvement in the Tripartite System, the testing of British and American munitions and the contributions made to developing BW stockpiles in these countries. According to open source material, the reestablishment of the Tripartite System after the war was initiated by Canadian scientists. From the outset the intention was that in allowing the USA and UK access to open air test grounds with scientific support on site, Canada would benefit from top-secret information on BW and fall under the umbrellas of US and UK biological deterrence.

As the summary above suggests, the CBM does not discuss BW policy. Considering that much of the weapons research in Canada was performed by the USA and the UK, Canada could probably avoid controversial policy matters. It was not until 1963, that Canada made a secret decision to support a retaliatory policy and a commitment to developing adequate defences against WMD. The CBM does not cover the intended military use of the weapons, nor the political thinking which sustained weapons development by other countries on Canadian soil.

The CBM also states that the offensive programme was terminated in 1956. However, it is clear that the USA pursued CBW munitions testing as part of its interest in large area field tests on at least three occasions with the help of Canadian scientists until 1968.¹⁰ Missing from the CBM is reference to an extensive anti-animal programme conducted out of Grosse Isle in the early 1950s in cooperation with US researchers. This programme was cancelled in 1954 after having identified efficient anti-animal agents, which included strains of rinderpest, african warthog disease, and fowl plague. Also missing from the CBM is information on the facilities engaged in BW activities. According to open source material these facilities were:

- Defence Research Establishment Suffield (DRES),
- Defence Research Establishment Ottawa (DREO),
- Defence Research Establishment Kingston (DREK),
- Grosse Isle Research Station (GIR).

⁹ Open source information on the Canadian past BW programme is taken from Avery, D. (2006): The Canadian Biological Weapons Program and Tripartite Alliance, in: Wheelis M., Rózsa L., Dando M. (2006): Deadly Cultures. Biological Weapons Since 1945, Harvard University Press: Cambridge and London, pp 84-107.

¹⁰ An interest in aerosol behaviour is mentioned in the description of Canada's past defensive biological programme; no details of these activities are provided.

While it is declared under other CBM forms, the omission of DRES, the largest BW testing ground in Canada, in Form F is disturbing. This facility covered 700 square miles, had a one square mile area surrounded by rodent proof fence and a 200 cubic meter explosion chamber.

Summary

Canada's CBM description of its past offensive BW programme is overly simple and incomplete. Substantial information regarding the offensive activities which were carried out within Canadian borders is missing, for example, Canada's involvement in the Tripartite System. There is a lack of information regarding the policy that guided the BW programme, and regarding military doctrine and termination of the programme. The only aspects of the programme the CBM does cover, though with little detail, are some elements of research, development and testing conducted exclusively by Canadian scientists. Table 1 summarizes the level of transparency provided for the different activities in the Canadian past offensive BW programme.

Table 1: Transparency regarding the Canadian past offensive BW programme

Admin.	Research	Developm.	Testing	Production	Stockpiling	Mil. doctrine	Conversion
				*	*		
Black boxes – No transparency; information on the particular activity is missing or appears contradictory to open sources. Grey boxes – Medium level of transparency; the particular activity is mentioned as having taken place (or not taken place), but no detail is provided or important detail is missing. White boxes – High level of transparency; detailed information on the particular activity is provided. * Production and stockpiling are afforded the highest level of transparency because neither has occurred in Canada.							

2.2. FRANCE

Year of last complete CBM Form F submission: 1992

Document containing last complete CBM Form F submission: DDA/4-92/BWIII/Add.2

Declared period of past offensive BW programme: 1946-1973

Length of declaration: Four pages

Submission history: No Form F submission since the first one in 1992.

Summary of information provided in the CBM

The French BW programme was established before the Second World War and, according to the CBM, carried on in much the same way after 1945. In the field, experiments including aerosol generation from ground dispersal units using numerous agents and simulants were conducted. In the laboratory, characterisation of BW agents was pursued as were weaponisation and dissemination experiments using simulant organisms. In the mid 1950s, an interarmy commission was established and charged with selecting agents, exploring industrial production and storage methods, and tests on the loading of biological material into military munitions.

The period between the late 1950s and early 1970s represented an uncertain period for the French BW programme due to numerous re-orientations in policy. BW development took a secondary role after nuclear weapons development. In order to create a BW arsenal, several areas of study were identified as necessary: the conditions for the use of biological agents, diffusion and dispersal, minimum dose experiments, and studies on viral ecology. Despite the writing of precise directives, no detailed protocols were established or budget allocated. Research focused on toxins (*Salmonella paratyphi*, *Staphylococcus aureus* and botulinum toxin) and bacterial and viral

pathogenesis. Fieldwork continued with a focus on the behaviour of aerosols. Lack of financial support, unclear definition of goals and weak organisation gave rise to mediocre results. According to the CBM, this was due to the lack of political will.

Although France did not immediately ratify the BWC, a national law was passed in 1972, which was, according to the CBM, more constraining on some issues than the international counterpart. As a result, defence research (detection and decontamination) was transferred from the Ministry of Defence to civilian departments. Offensive research was terminated. Only a few studies continued to be pursued, including, a theoretical threat assessment of potential BW agents, a threat assessment of terrorist BW use and the methods of BW dispersion available to terrorists.

Evaluation of CBM information and comparison with open sources¹¹

The French CBM provides a superficial view of France's past offensive biological activities. While it mentions all of the activities carried out within the BW programme, many details are lacking. Comparing the CBM with open source material demonstrates where detailed information could be added.

The CBM is largely consistent with open source material in that dwindling political interest and financial resources were a significant barrier to progress in BW development. As in the CBM, open sources divide the French BW programme into two phases. The first, between the end of the Second World War and 1956, is characterised by extensive research and development on all aspects of weapons development: dispersion using various agent preparations, agent characterisation and virulence studies, agent stability and storage, field trials using test animals, munitions testing, protection and detection. The strong political commitment was partially in response to intelligence regarding US and Soviet programmes. The second phase beginning in 1956 was a gradual phasing out of the political interest and financial support with priorities shifting towards the development of nuclear weapons. Constant reorganisation gave rise to confusion in which scientists were often left without clear instructions. On several occasions, calls were made to develop a BW arsenal in France, but no concrete steps were taken in this direction.

A slight revival of interest was seen in the early 1960s when the possibility of incapacitating agents was conceived. France's interest was aroused by the USA's apparent superiority in the area. A significant amount of research was undertaken between 1962 and 1964 including on agent production, weapons testing, detection and protection. Calls for the creation of a BW arsenal occurred towards the end of this period. However, this interest abated several months later and the last efforts to maintain an offensive capability were lost by 1966.

With regard to the field trials conducted between 1948 and 1953, the CBM fails to mention details such as the organisms used, the location of testing, the number of tests or the intended goals. It states that numerous agents were used in aerosol emission trials, but fails to name any, including the simulants. A number of toxins which were studied are mentioned in the CBM: Salmonella endotoxin, Staphylococcal enterotoxin B and a number of botulinum toxins. Open sources suggest the following organisms were used during the French BW programme: Salmonella

¹¹ Open source information on the French past BW programme is taken from Lepick, O. (2006): The French Biological Weapons Program, in: Wheelis M., Rózsa L., Dando M. (2006): Deadly Cultures. Biological Weapons Since 1945, Harvard University Press: Cambridge and London, pp 108-131.

typhimurium, Bacillus anthracis, Clostridium botulinum, and as incapacitants: Brucella abortus, Erysipelothrix insidiosus, Listeria monocytogenes, Bacillus cereus, Shigella flexneri, Salmonella enteritidis, certain adenoviruses, coxsackie viruses and influenza viruses. According to open sources substantial research was also conducted on improving the stability of agents during dispersal and storage, including lyophilization of pathogenic agents and toxins to increase their preservation. Little of these studies is mentioned in the CBM.

The CBM also fails to provide an indication of the size of the programme of which one indication is the number of facilities involved. Only one BW facility is mentioned in the CBM, the Centre d'Etudes Bouchet. According to open sources, other facilities include:

- Service de Technique des Armées – Auberville,
- Centre de Service Biologique et Veterinaire – Maisons-Alfort,
- Centre de Recherche du Service de Santé des Armées – Lyon,
- Centre de Service Biologique et Veterinaire – Tarbes.¹²

The CBM further states that France did not engage in any development, seemingly contradictory to the admittance further on of experimentation with munitions loading. Open sources quote a report from the Centre d'Etude Bouchet indicating studies on production, conservation and dispersal using projectiles, mines, mortars, missiles and other explosives.

As far as military strategies and doctrine, according to open sources France had developed BW strategies, particularly in coordination with irradiated targets. There were clearly envisioned uses for these weapons and at a national policy level, France followed a BW retaliatory doctrine.

Summary

The CBM gives a very general description of the activities conducted within the French BW programme, but provides little details e.g. on organisms and facilities. Information on military doctrine is lacking. And little effort is made to describe how offensive activities were terminated. Table 2 summarizes the level of transparency provided for the different activities in the French past offensive BW programme.

Table 2: Transparency regarding the French past offensive BW programme

Admin.	Research	Developm.	Testing	Production	Stockpiling	Mil. doctrine	Conversion
Black boxes – No transparency; information on the particular activity is missing or appears contradictory to open sources.							
Grey boxes – Medium level of transparency; the particular activity is mentioned as having taken place (or not taken place), but no detail is provided or important detail is missing.							
White boxes – High level of transparency; detailed information on the particular activity is provided.							

¹² The facility in Tarbes is mentioned in the description of the past defence programme. Open sources suggest, however, that this facility was involved in weapons testing and development of numerous viral and bacterial BW agents.

2.3. IRAQ

Year of last complete CBM Form F submission: 1996

Document containing last complete CBM Form F submission: CDA/11-96/BW-III/Add.1

Declared period of past offensive BW programme: 1985 - 1991

Length of declaration: Two pages

Submission history: The first CBM Form F submission was provided in 1993, and stated that no offensive BW programme had taken place. No Form F was submitted with Iraq's 1995 CBM. In 1996, Iraq's Form F submission declared the existence of a former offensive BW programme. No Form F submission has been provided since 1996.

Summary of information provided in CBM

According to the CBM, Iraq's BW programme began at Al-Muthanna in 1985, although no research was carried out until 1986. During the first year, industrial equipment and materials were purchased and scientific literature was gathered. *Clostridium botulinum* and *Bacillus anthracis* were the first agents to be acquired and extensively studied for BW purposes. The facility at Al-Muthanna contained three labs, two for toxicological evaluation and a third for fermenters. The following year, research with *Clostridium perfringens* began, although, according to the CBM, this organism never reached the production stage. In 1988, work began on establishing a production capability for several BW agents. The Al-Hakam site, which was completed by the end of 1988, was chosen as the main production facility. Agent production and storage of *Clostridium botulinum* and *Bacillus anthracis* began in 1989 and continued until December 1990.

Also in 1988, exploratory work on aflatoxin began. Initially, this agent was produced for field trials and later on an industrial scale at the Foudhailiyya facility until 1991. A ricin programme was initiated in 1990 and reached field trials; however, the results achieved were not encouraging and the programme was soon discontinued. In the beginning of 1990, activities at the Technical Research Center at the Salman site were expanded to include a genetic engineering unit and a virology unit. Both units were tasked with improving and identifying new agents for potential use in Iraq's BW programme. They were both discontinued at the beginning of 1991. At Al-Muthanna, aerial munitions, R-400 aerial bombs and Al Hussein missile warheads, were loaded with biological agents. Table 3 shows which activities were pursued at the declared BW facilities.

Termination of the offensive BW programme began in May 1991 and all biological munitions and stockpiled pathogens were subsequently destroyed.

Table 3: Location and activities of facilities in the Iraqi BW programme as declared in the CBM

Location	Activity
Al-Muthanna	Toxicological evaluation building contained three laboratories: two for toxicological studies and one for laboratory fermenters. The facility was also used for munitions testing and loading of R-400 aerial bombs and Al Hussein missile warheads.
Technical Research Center (TRC) Salman site	Contained a number of laboratories used for biological forensic research. Genetic engineering and virology units established in 1990 and closed in 1991.
Al-Hakam	Production and storage facility which carried out production of <i>Clostridium botulinum</i>

Location	Activity
	and Bacillus anthracis.
Foudhailiyya	Production facility for aflatoxin.

Evaluation of CBM information and comparison with open sources¹³

The CBM provides a relatively comprehensive description of the Iraqi BW programme.

The CBM states that the BW programme began in 1985. However, open sources indicate that the Ibn Sina Centre, opening in 1974, was run under the direction of state security agencies. This is believed to be the first attempt to establish a BW programme. The facility closed in the late 1970s, and little is known about the progress made during these years. This facility is not mentioned in the CBM.

Between 1985, the declared beginning of the BW programme, and 1991, the declared end, the CBM is quite accurate. Only one facility which features somewhat prominently in open sources is not mentioned, the Foot and Mouth Disease Vaccine (FMDV) production site at Dawrah, south east of Baghdad. Before its partial conversion to the production of botulinum toxin, this facility produced FMDV. This facility also conducted research on viral agents, camelpox, enterovirus 70 and human rotavirus.

Finally, the CBM declares that the testing of munitions was restricted to the Al-Hussein missile warheads and R-400 aerial bombs. According to open sources, rocket warheads, LD 250 aerial bombs and fragmentation bombs were also tested. In addition, aircraft were modified to disperse biological agents from drop tanks.

Summary

Much is known about the Iraqi BW programme as a result of years of inspections by UNSCOM/UNMOVIC. The last version of the CBM was submitted at a time when Iraq had finally decided to acknowledge the existence of a large-scale BW programme and provided detailed information to UN inspectors. The CBM reflects this information with some minor omissions. It provides a comprehensive look at most of the BW facilities and information on research and development occurring there. Fewer details are provided on testing and stockpiling. The CBM fails to make reference to military doctrine, and provides little information on the decommissioning of programmes and facilities. Table 4 summarizes the level of transparency provided for the different activities in the Iraqi past offensive BW programme.

¹³ Open source information on the Iraqi past BW programme is taken from the Twenty-second quarterly report on the activities of the United Nations Monitoring, Verification and Inspection Commission in accordance with paragraph 12 of Security Council resolution 1284 (1999), S/2005/545, August 30, 2005.

Table 4: Transparency regarding the Iraqi past offensive BW programme

Admin.	Research	Developm.	Testing	Production	Stockpiling	Mil. doctrine	Conversion
Black boxes –	No transparency; information on the particular activity is missing or appears contradictory to open sources.						
Grey boxes –	Medium level of transparency; the particular activity is mentioned as having taken place (or not taken place), but no detail is provided or important detail is missing.						
White boxes –	High level of transparency; detailed information on the particular activity is provided.						

2.4. RUSSIAN FEDERATION

Year of last complete CBM Form F submission: 1992

Document containing last complete CBM Form F submission: DDA/4-92/BWIII/Add.3

Declared period of past offensive BW programme: 1946-1992

Length of declaration: Six page combined description of past offensive and defensive programmes.

Submission history: No CBM Form F submission after 1992.

Summary of information provided in the CBM

According to the CBM, the Soviet Union embarked on its BW programme under the direction of the Ministry of Defence at the end of the 1940s as a response to foreign threats. Experimental work on pathogens began in the 1950s with *Bacillus anthracis*, *Francisella tularensis*, *Brucella* spp., *Yersinia pestis*, *Rickettsia prowazekii*, *Coxiella burnetii*, botulinum toxin and venezuelan equine encephalomyelitis. These agents were tested on animals and the possibility to use live aerosolized vaccines in order to convey immunity was explored. This research was conducted at facilities in Sverdlovsk, Zagorsk and Kirov.

The first attempt at industrial production occurred in the mid 1960s with production facilities being constructed at Sverdlovsk and Zagorsk. These plants had culture medium, concentration, purification and waste water treatment units. According to the CBM, no BW agents were ever prepared or stored at these sites although activation of the facilities could be ordered by Moscow. The CBM also states that no stockpiles of any BW agents were ever maintained throughout the programme.

Aerosol test chambers were constructed as well as an open air test site on the island of Vozrozhdenie. These facilities were used to test the efficiency of BW agents produced and to develop protection against them. Outdoor field trials included experimental testing of munitions, diffusion devices and detection systems. In parallel, BW agent characterisation continued with other organisms, such as glanders and melioidosis until 1975, as did the development of new bacterial vaccines, anatoxins, diagnostic kits, gammaglobulins, serums and other forms of treatment.

At the end of the 1960s, construction began on an industrial plant for the manufacturing of protective equipment and BW agents. This facility, however, never reached completion due to building delays and the ratification of the BWC.

In the early 1970s, an effort was made to kick start the Soviet biological industry. Numerous government bodies collaborated in order to enhance research and education and develop a defensive biological programme. These bodies included parts of the Central Administration for the Microbiological Industry in Koltsovo, Obolensk and Leningrad which were tasked with assessing protection against biological agents, including those aerosolized.

According to the CBM, termination of the military BW programme began in anticipation of the Second BWC Review Conference in 1986 and because of the political pressure to report on BW related activities to the UN. Production lines were dismantled in Ministry of Defence facilities. However, BW related research carried on. By 1992, important policy changes had been made. President Boris Yeltsin lifted reservations placed on the 1925 Geneva Protocol. A committee on the problems of chemical and biological weapons was established to monitor domestic compliance with the BWC as well as implement a presidential decree criminalising any actions contrary to the BWC. The main Soviet open air testing facility on Vozrozhdenie Island was closed and the military programme at the Sverdlovsk facility was drastically reduced, maintaining only a BW defence programme.

Evaluation of CBM information and comparison with open sources¹⁴

Despite accusations of significant omissions, no updated CBM Form F submission has been provided since Russia's first and only submission in 1992. The relatively short description, the confusing recounting of both offensive and defensive activities in one narrative, and the fact that the CBM provides only fleeting references to the offensive aspects of the biological programme result in a misleading impression of the aim and size of the Soviet offensive BW programme. According to open sources, the Soviet programme was the largest BW programme known, employing up to 60,000 individuals.

The CBM states that the BW programme was terminated in 1992, admitting to a breach of the BWC, which the Soviet Union had ratified in 1975. According to open sources, so deliberate was this breach that a resolution to strengthen basic and applied research on BW was taken by the Soviet Communist Party Central Committee the year the BWC was ratified. The following year, the Politburo took a decision to further expand the BW programme based on a recommendation from the 15th Directorate, the body effectively running the BW programme at the Ministry of Defence. The CBM gives no indication as to why the Soviet leadership felt it necessary to build a BW capacity despite the international ban. Open sources speculate that the Soviet Union suspected a US breach.¹⁵

The CBM lacks reference to the offensive intentions of the BW programme. The CBM describes the motivations for initiating the programme as the "creation of its own system of Ministry of Defence facilities designed to perform tasks related to the development of biological weapons...." only, however, as a response to "evidence that many countries possessed significant potential for the development and production of biological weapons". It seems that the CBM sought to de-emphasise the breach of the BWC by suggesting that activities focused on defensive aspects of BW and that its intention was strictly retaliatory. Mention of testing of rocket-propelled missiles and diffusion devices on the island of Vozrozhdenie, the major Soviet field trial site, are the only references to offensive activities provided by the CBM. From open sources it is clear that much effort was invested in advanced genetic engineering techniques aimed at altering organisms in order to increase lethality by eliciting an auto-immune response to common human molecules,

¹⁴ Open source information on the Russian past BW programme is taken from Hart, J. (2006): The Soviet Biological Weapons Program, in: Wheelis M., Rózsa L., Dando M. (2006): Deadly Cultures. Biological Weapons Since 1945, Harvard University Press: Cambridge and London, pp 132-156.

¹⁵ This may have been as a result of the US's active dissemination of false information on military activities.

providing resistance to several antibiotics, avoiding immune responses and increasing virulence through the simultaneous use of a second agent. Organisms used in offensive research included *Legionella* spp., *Brucella* spp., *Bacillus anthracis*, ebola virus, marburg virus, junin virus, lassa virus, machupo virus, *Burkholderia mallei*, *Burkholderia pseudomallei*, *Yersinia pestis*, variola virus and *Francisella tularensis*.

Many details of what is considered central to the Soviet BW programme is missing from the CBM. Biopreparat is one of the principle omissions. Biopreparat was formed in 1972 and coordinated the civilian, although military controlled, BW programme. It is thought to have employed up to 3,500 individuals and consisted of at least 20 facilities, including two of the most prolific, the All-Union Institute of Highly Pure Biological Preparations in Leningrad and the All-Union Research Institute of Molecular Biology “Vector” in Koltsovo. The former attempted to weaponise tularaemia and later *Yersinia pestis* and had, by 1987, a production capacity of 200 kg per week. The latter conducted work mostly on viral pathogens such as Ebola, Marburg, Lassa and the eradicated smallpox virus.

Other major research facilities included the All-Union Scientific Research Institute of Applied Microbiology in Obolensk, the Institute of Experimental Hygiene in Kirov (now Vyatka) and the Institute of Microbiology of the Ministry of Defence in Zagorsk (now Sergeev-Posad). These facilities are mentioned briefly in the CBM, but their offensive activities are not described. Furthermore, a number of civilian institutions, including academies of science and university departments were also involved in BW development in some capacity, but are not mentioned in the CBM.

The CBM makes little reference to BW production. It states only that in the mid 1960s experimental production plants were constructed in Sverdlovsk and Zagorsk, but never engaged in preparation or storage. A number of production and storage facilities are mentioned in open sources, including facilities in Kurgan, Penza, Sverdlovsk, Stepnogorsk, Berdsk and Omutninsk. In the CBM, only one out of these six facilities – Sverdlovsk – is mentioned in connection with production. Experts with first hand knowledge suggest that the Soviet Union maintained substantial stockpiles of *Bacillus anthracis* and *Yersinia pestis* and continuously replenished them as the organisms became inactive.

Little information on how the BW programme was terminated is provided. The CBM states that the “dismantling of apparatus and production lines” and the conversion “for economic production purposes” occurred at Ministry of Defences facilities, but does not mention which ones. The CBM also mentions that parts of the facility in Sverdlovsk were converted into a factory for antibiotics and that the military biological programme was “cut to minimum level” to pursue defensive activities only. In addition, reference is made in the CBM to the closure of the facility at Vozrozhdenie Island. The conversion of many other Soviet facilities is also not mentioned in the CBM, including facilities in Koltsovo, Obolensk and Leningrad.

Summary

The CBM mentions a number of aspects of the Soviet BW programme but provides a misleading impression of the aim and size of this programme. An important lesson to be learnt from the Russian CBM is that descriptions mixing offensive and defensive activities must be avoided. Such a description leaves too much room for ambiguity. The CBM provides some details on research, testing and production. However, these are not always consistent with open sources and

sometimes – especially with regard to production – directly contradictory. The CBM does not provide information on development, stockpiling and military doctrine, and little detail on the termination of the BW programme. Table 5 summarizes the level of transparency provided for the different activities in the Soviet past offensive BW programme.

Table 5: Transparency regarding the Soviet past offensive BW programme

Admin.	Research	Developm.	Testing	Production	Stockpiling	Mil. doctrine	Conversion
Black boxes –	No transparency; information on the particular activity is missing or appears contradictory to open sources.						
Grey boxes –	Medium level of transparency; the particular activity is mentioned as having taken place (or not taken place), but no detail is provided or important detail is missing.						
White boxes –	High level of transparency; detailed information on the particular activity is provided.						

2.5. SOUTH AFRICA

Year of last complete CBM Form F submission: 1994

Document containing last complete CBM Form F submission: CDA/14-95/BW-III/Add.2

Declared dates of past offensive BW programme: none

Length of declaration: n/a

Submission history: Form F declared that no offensive BW programme existed prior to 1993. This statement was reaffirmed in 1994.

Summary of information provided in the CBM

South Africa has never submitted a CBM acknowledging the existence of a past offensive BW programme.

Evaluation of CBM information and comparison with open sources¹⁶

Much of what is known about the South African chemical and biological weapons (CBW) programme, dubbed Project Coast, derives from the trial of Dr. Wouter Basson and the numerous statements made by scientists during the Truth and Reconciliation Commission (TRC) hearings, a commission which sought to shed light on the wrongdoings of the Apartheid government, in order for the country to come to terms with past actions. In comparison to other countries' programmes, Project Coast was relatively small. It was established in 1983, eight years after the entry into force of the BWC,¹⁷ and knowledge of its existence was carefully guarded so as not to attract international attention. The programme was run behind a mask of front companies, which also conducted legitimate commercial research in order to hide the military's involvement. The purpose of the programme was to strengthen the Apartheid regime amid a climate of civil uprising and to build a defence capacity for South African troops fighting in Angola. In the laboratory, scientists attempted to develop new crowd control agents and provide the police and military with weapons suitable for assassination.

¹⁶ Open source information on the South African past BW programme is taken from Gould, C. and Hay, A. (2006): The South African Biological Weapons Program, in: Wheelis M., Rózsa L., Dando M. (2006): Deadly Cultures. Biological Weapons Since 1945, Harvard University Press: Cambridge and London, pp 191-212.

¹⁷ South Africa signed and ratified the BWC with the first wave of countries in 1972 and 1975, respectively.

According to open sources, the front company undertaking most of South Africa’s BW research was Roodeplaat Research Laboratories (RRL). The majority of research focussed on the toxicology of several microorganisms, including, Clostridium botulinum and Clostridium perfringens. Research with infectious diseases included work on Bacillus anthracis and Salmonella spp.. Although some research conducted at RRL may have been defence oriented, one particular project which attracted much attention during the TRC hearings was an effort to develop an antifertility vaccine to be administered to black women without their knowledge. There was also a significant interest in developing a CW capability at the same facility. Production of agents, on the other hand, was concentrated in another front company, Delta G Scientific.

The secrecy with which this programme was run allowed paper trails to be avoided because directives were mostly provided verbally. As a result, no official documentation can be found detailing South Africa’s military strategy for these weapons. Therefore, it is not clear to what extent the programme was integrated into the South African military machinery or was part of the personal ambitions of a number of “bad apples”.

The BW programme was effectively terminated several years after the privatisation of RRL, which occurred in 1991.¹⁸ RRL was declared bankrupt four years later.

Summary

South Africa has never submitted a CBM acknowledging and providing details on its past offensive BW programme. The position maintained in the CBM, furthermore, is misleading because not only does South Africa not provide information, it explicitly states that no efforts were undertaken, a clear misrepresentation of what occurred. South Africa’s failure to be shed light on activities undertaken as part of Project Coast in the CBM is at odds with its otherwise longstanding commitment to the BWC and does not help to promote transparency in a region where CBM participation is already below average. Table 6 summarizes the level of transparency provided for the different activities in the South African past offensive BW programme.

Table 6: Transparency regarding the South African past offensive BW programme

Admin.	Research	Developm.	Testing	Production	Stockpiling	Mil. doctrine	Conversion
Black boxes – No transparency; information on the particular activity is missing or appears contradictory to open sources.							
Grey boxes – Medium level of transparency; the particular activity is mentioned as having taken place (or not taken place), but no detail is provided or important detail is missing.							
White boxes – High level of transparency; detailed information on the particular activity is provided.							

¹⁸ For an official declaration from South Africa on the termination of Project Coast see South African Government Communications and Information System (GCIS) (1998): Statement on the TRC hearings on the CBW programme, 15 June 1998, Pretoria.

2.6. UNITED KINGDOM

Year of last complete CBM Form F submission: 1993

Document containing last complete CBM Form F submission: ODA/9-93/BWIII

Declared dates of past offensive BW programme: 1940-1957

Length of declaration: Less than one page

Submission history: Identical CBM Form F submissions in 1992 and 1993. No submission since 1993.

Summary of information provided in the CBM

According to the CBM, concerns over BW in the UK began in the 1920s, although it was not until the 1940s that a government body was officially tasked with research and development. The Chemical Defence Experimental Station (CDES) was mandated with “assessing the feasibility of BW and to acquire the means to retaliate in the event of use of BW against the UK or its allies”.

The majority of BW research occurred at Biology Department Porton (BDP), at the time a small autonomous facility within the CDES. BDP was tasked with identifying the necessary defensive measures to protect the UK and with developing a retaliatory capacity. According to the CBM, offensive work focused mostly on field trials of anthrax on Gruinard Island between 1942 and 1943. Success in these trials led to a joint effort by the UK, USA and Canada, aimed at developing an anthrax filled cluster bomb, termed the N-bomb. This programme never achieved operationality and the UK retaliatory capacity was thought to be fulfilled by anthrax contaminated cattle cakes, an anti-animal aircraft delivered BW munition. Between 1942 and 1943 a stockpile of 5,000,000 was produced and stored at Porton Down. After the war, with an exception of 400 cattle cakes the stockpile was destroyed. The remaining 400 were stored at the Microbiological Research Establishment (MRE) until the signing of the BWC. According to the CBM, the UK had largely abandoned its offensive BW research after WWII and by 1957 only defensive activities were carried out.

Evaluation of CBM information and comparison with open sources¹⁹

The one page declaration is a very vague account of the UK's BW programme. The focus lies almost exclusively on activities carried out during World War II. The description of activities undertaken after 1945 is extremely short, very general and lacks critical details. The CBM declares little in regard to the policy which shaped the country's BW programme. According to open sources, interest in BW was not stable and relevant activities were carried out in waves.

Initially, the UK had seen CBW as an equally powerful deterrent as nuclear weapons. Furthermore, the UK found good reasons to develop a BW capacity, namely, the geographical position of an island allows enemies to use BW without the risk of contaminating its own troops.²⁰ As a result, early stages of the BW programme showed a strong commitment to

¹⁹ Open source information on the British past BW programme is taken from Balmer, B. (2006): The UK Biological Weapons Program, in: Wheelis M., Rózsa L., Dando M. (2006): Deadly Cultures. Biological Weapons Since 1945, Harvard University Press: Cambridge and London, pp 47-83.

²⁰ Later on, there were suggestions that the UK was so dense in population and industry that nuclear weapons would be more effective than BW.

developing BW, with a clear idea about types and envisioned uses of BW.²¹ In the late 1940s, the construction of an agent production facility began in Porton Down. At the same time, calls were made for the development of a BW bomb with strategic effects comparable to nuclear weapons by 1957. This top secret programme was referred to as Operation Red Admiral.

The interest in BW began to decline during the 1950s with the nuclear programme gradually taking priority. Views on the military utility of BW grew more and more sceptical. Studies during the early 1960s suggested that the USSR was not even a suitable target for BW attack. Although this stance was criticized for its lack of foresight, suggesting that new technologies might increase the effectiveness of BW against the Soviet Union. During this period BW was labelled as insignificant and of “negligible additional deterrent [value]” and proponents of a BW arsenal struggled with a lack of political support, a tightening budget and a growing reluctance to engage in any offensive BW activities.

At roughly the same time, the potential for BW to be used as a covert instrument or in acts of sabotage became appealing to British BW experts. As a result, there was a shift of focus from the BW bomb, heavily supported by the American programme at the time, to large area coverage and the more clandestine uses of BW, including incapacitating agents.

In the early 1960s, the UK adopted a new strategic outlook towards BW in response to the nuclear stalemate between the two blocks and the USA’s increasing reluctance to share nuclear secrets. For a short period it was thought that the playing field in BW was more level. Offensive research gained favour among policy makers – if only for a short while – although there is no indication that any research took place. Ultimately, it was concluded that in the event of an attack against the UK or one of its allies, the response would be the use of a nuclear weapon. Furthermore, the UK certainly did not want to be the first to use BW because of its perceived state of vulnerability. None of these considerations are mentioned in the CBM. The short declaration offers a misleading picture of the UK’s interest in biowarfare after 1945.

Equally misleading is the description of postwar BW activity. The CBM states that “[w]hilst some research on offensive aspects continued for a few years after World War II, by 1957 the UK had abandoned work on an offensive capability”. The “research” that is referred to – which is more accurately described as development and testing – consisted of a series of open-air sea trials exposing test animals to a number of pathogenic agents:

- 1948: Operation Harness (Antigua, Caribbean Islands) using *Bacillus anthracis*, *Brucella suis*, *Brucella abortus* and *Francisella tularensis*.
- 1952: Operation Cauldron and Hesperus (off the coast of the Scottish island of Lewis) using *Yersinia pestis*, *Brucella suis*, and *Francisella tularensis*.
- 1954: Operation Ozone (Nassau, Caribbean Islands) using *Brucella suis*, *Francisella tularensis* and Venezuelan equine encephalitis.
- 1954-1955: Operation Negation (Bahamas) using *Brucella suis*, *Francisella tularensis* and vaccinia virus.

The goal of these trials was to assess the survival of airborne particles in real conditions and their diffusion. According to the CBM, which does not provide any specific detail, these tests were

²¹ For instance, it was suggested to build a 1000 pound “parent” cluster bomb with numerous smaller “child” bombs. The usefulness of targeting skilled personnel was also highlighted.

conducted as part of the UK’s BW defence programme, in order “to determine the feasibility of conducting trials at sea and latterly to acquire data on the behaviour of microbial aerosols under realistic conditions”. Nevertheless, the use of pathogenic organisms in large scale open air trials has obvious offensive characteristics. Despite doubts being expressed by the end of Operation Negation, other open air trials took place in the Irish Sea towards the end of the 1950s in response to an increasing feeling of vulnerability to large toxic clouds. These tests, twelve of which were ultimately carried out, simulated BW dispersal using tracer particles of zinc cadmium sulfide. By the early 1960s, more open air tests were being conducted in the south of England using simulants organisms, including one trial in the London Underground. According to open sources, a series of open air tests were conducted on navy vessels after it was concluded that military personnel was at more risk than the general public. These vulnerability trials still had offensive aspects even if the intention was defence oriented. Furthermore, they are not mentioned in either the offensive or the defensive sections of the CBM Form F.

Summary

The CBM mentions most of the activities conducted during the UK’s BW programme in either the offensive or defensive declaration. However, there is a lack of detail on these activities, and their intentions remain somewhat unclear. The use of live pathogenic agents in large scale open air trials, for instance, has obvious offensive characteristics, but is mentioned only in the description of past defensive activities, and details are not provided. Open air trials using simulants are not mentioned at all, not even in the declaration on past defensive activities. Reference is made in the CBM to the production and stockpiling of BW during the Second World War. Open sources indicate that a production facility was constructed in the late 1940s. The CBM does not clarify, whether production was limited to activities during World War II or was also pursued later on during the programme. The CBM refers to offensive research but provides very little information. It mentions the destruction of the cattle cakes, but gives little detail on why and how the BW programme was terminated. No reference is made in the CBM to development or military doctrine. Table 7 summarizes the level of transparency provided for the different activities in the British past offensive BW programme.

Table 7: Transparency regarding the British past offensive BW programme

Admin.	Research	Developm.	Testing	Production	Stockpiling	Mil. doctrine	Conversion
Black boxes –	No transparency; information on the particular activity is missing or appears contradictory to open sources.						
Grey boxes –	Medium level of transparency; the particular activity is mentioned as having taken place (or not taken place), but no detail is provided or important detail is missing.						
White boxes –	High level of transparency; detailed information on the particular activity is provided.						

2.7. UNITED STATES

Year of last complete CBM Form F submission: 1997

Document containing last complete CBM Form F submission: CDA/BWC/1997/CBM

Declared dates of past offensive BW programme: 1941-1969

Length of declaration: 13 pages

Submission history: First CBM Form F submissions in 1992. A more detailed submission was made in 1994, which was again submitted in 1995. Updated submissions were made in 1996 and 1997. No Form F submission since 1997.

Summary of information provided in the CBM

According to the CBM, the US BW programme began in 1941 as a response to foreign biological threats. From the outset US policy towards BW use was strictly in retaliation. During the initial period of the programme research focused on agent characterisation, including studies on viruses and rickettsia, anti-plant and anti-animal agents, physical protection and the design and testing of production facilities, including small outdoor testing locations. In the first ten years no operational readiness was maintained and no stockpiling occurred although conversion to BW production in several facilities could be achieved rapidly if the need arose.

The research focus shifted in the 1950s to aerobiology and involved the construction of numerous testing facilities, including Camp Detrick's 1,000,000 litre 8-ball sphere, and large open-air field tests using infectious anti-human, anti-plant and anti-animal agents, and simulants. The early 1950s also saw the first bulk storage of a BW agent - stem rust of wheat - and the large-scale production of other pathogenic agents including *Francisella tularensis*, *Brucella suis* and later on *Clostridium botulinum* and a number of other organisms.

The increased importance given to BW was brought about by a report prepared by the biological, chemical and radiological Ad Hoc Group in 1950 for the Secretary of Defence, which called for an expansion of the BW programme on all levels. The Secretary of Defence adopted these recommendations, which also included a regulatory separation of CW and BW programmes. In parallel US strategic policy towards BW was re-evaluated with an overhaul of the retaliatory principle to allow greater flexibility for use. To this end, the decision to use BW was assigned to the discretion of the president. This change in policy was followed by a continued expansion of the BW programme. Focus was placed on agent stability and more efficient dispersal, using a number of new techniques such as microencapsulation, and increasing in scale as demonstrated by operation Large Area Coverage (LAC) involving the dispersal of particles over large areas of the USA. Munitions production also occurred in the form of anti-personnel cluster bombs with anti human agents. Throughout the 1960s outdoor field testing of a number of agents and in a number of environmental conditions - including arctic, marine, and woodland - continued.

Implementation of a new action plan, proposed by the Joint Chiefs of Staff in the early 1960s, resulted in an accelerated expansion and modernisation of the BW programme. This meant an increased focus on incapacitating agents, the reactivation of anti-plant programmes and the undertaking of extracontinental BW testing supported by the newly established BW test-coordinating facility, the Desert Test Center. Towards the end of the 1960s, despite the Vietnam War forcing a tightening of the programme's budget and scope, BW agent production and bulk storage continued with some weaponisation occurring. Table 8 summarizes the degree to which

agents were used in the BW programme. Table 9 lists information on the facilities involved in the BW programme.

Table 8: Agents and their degree of involvement in the US BW programme as declared in the CBM

Agent	Research	Testing	Production	Storage
Anti-human agents				
Bacillus anthracis	X	X	X	X
Bacillus melitensis	X	X		
Brucella suis	X	X	X	X
Chlamydia psittaci	X	X		
Clostridium botulinum	X	X	X	X
Coccidioides immitis	X			
Coxiella burnetii	X	X	X	X
Francisella tularensis	X	X	X	X
Staphylococcus enterotoxin B	X	X	X	X
Yersinia pestis	X	X	X	X
Venezuelan equine encephalomyelitis	X	X	X	X
Simulants				
Bacillus globigi	X	X	X	
Escherichia coli	X	X		
Serratia marcescens	X	X		
Anti-plant agents				
Rice blast	X	X	X	X
Rye stem rust	X	X	X	X
Wheat stem rust	X	X	X	X
Anti-animal agents				
Hog cholera virus	X	X		
Newcastle disease	X	X		
Rinderpest	X			

In the late 1960's a number of BW production programmes were discontinued as a result of the impending programme termination. By 1969 and the early 1970s, President Nixon, upon consultation with the National Security Council, renounced BW, calling on the military to terminate all offensive research, testing and production and to destroy all stockpiles.

Evaluation of CBM information and comparison with open sources²²

The CBM submitted by the USA for the first time in 1992, and amended in 1994, 1996 and 1997, is a very comprehensive account of the US BW programme. It is by far the most accurate and complete declaration submitted by any country. Nevertheless, a few inconsistencies and omissions were identified during the comparison with open sources.

According to the CBM, large area vulnerability testing began in the 1950s in San Francisco and off the coast of Norfolk, VA, using simulant agents and fluorescent particles. According to open sources, however, large area testing was conducted in other locations as well, including Minneapolis (1953) and St. Louis (1953). Other large area testing took place in Hawaii, California, the Panama Canal Zone, and the Canadian Great Plains. Open sources also provide information regarding testing in urban areas in several locations. In 1965, trials were conducted covertly disseminating *Bacillus globigii* from a modified briefcase in the Greyhound Bus Terminal and the North Terminal of the National Airport, both in Washington DC. In 1966, *Bacillus subtilis* was disseminated in the New York City subway system. No mention of these additional trials is made in the CBM.

Operation WHITECOAT was a human testing initiative carried out in order to test the effects of a number of pathogenic organisms on army volunteers. Volunteers were exposed to the agents via aerosol inhalation, airborne particles (sneezing and coughing), syringe and inoculation, and their progress and treatment was monitored. Between 1955 and 1973, the active years of Operation WHITECOAT, the following agents were tested: Q fever, tularemia, sandfly fever, typhoid fever, eastern, western and venezuelan equine encephalitis, rocky mountain spotted fever and rift valley fever. The CBM does mention Operation WHITECOAT, but provides very little detail. According to open sources, other human testing activities reportedly took place at a number of other sites including Fort Detrick and an Ohio State Penitentiary, with a number of other agents, including *Bacillus anthracis* and *Clostridium botulinum*.

The CBM describes an operational readiness in 1954 consisting of anti-personnel cluster bombs and spray tanks. Open sources indicate that a larger choice of BW munitions were available by that time, including bomblets, mines, portable generators, and sergeant rockets. The CBM later mentions that limited weaponization occurred in various weapon systems in the mid 1960s, but does not provide details, including the organisms involved.

²² Open source information on the US past BW programme is taken from van Courtland Moon, J. (2006): The US Biological Weapons Program, in: Wheelis M., Rózsa L., Dando M. (2006): *Deadly Cultures. Biological Weapons Since 1945*, Harvard University Press: Cambridge and London, pp 9-46.

Table 9: Information on facilities involved in the US BW programme as declared in the CBM

Facility / Location	Year activated	Year deactivated	Activity	Agent/disease
Avon Park, FL	1956	1958	Testing mosquitoes as vectors for BW dissemination	Not given
Beale Air Force Base, CA	1969	1971-73	BW agent stockpiling	Not given
Between Rocky Mountains and the Atlantic Ocean, and Canada and the Gulf of Mexico	1957	1958	Operation Large Area Coverage (LAC): Large area dissemination testing	Microscopic particles
Camp (later Fort) Detrick, MD	1941-42	Not given	Production, testing, research, stockpiling, human testing	Botulinum toxin, Bacillus anthracis, Bacillus globigi, Serratia marcescens, Escherichia coli, rice blast
Pilot plant 1	1943	Not given	Botulinum toxin production	
Pilot plant 2	1944	Not given	Bacillus anthracis production	
Pilot plant 3	1945	Not given	Plant pathogen research	
Pilot plant 4	1945	Not given	Research on non-vegetative bacteria and growth of rickettsial agents in eggs	
Fort Detrick Arsenal	Not given	1971-73	Stockpiling of BW agents	
Caribbean Sea	1948	1949	Joint British-US BW testing	Brucella suis, Francisella tularensis, Bacillus anthracis
Deseret Test Center (DTC), Fort Douglas, Salt Lake City, UT	1962	Not given	Coordinating body for BW agent trials	Not given
Dugway Proving Ground, UT	1949	Not given	Outdoor field testing of simulant and pathogenic agents, and BW munition loading and testing	Coxiella burnetii, Yersinia pestis, Brucella suis, Francisella tularensis, Chlamydia psittaci, Clostridium botulinum, Brucella melitensis, Bacillus anthracis, stem wheat rust, Coccidioides immitis, rice blast
Edgewood Arsenal, MD	1951	Not given	Anti-plant agent production and storage	Wheat stem rust, rye stem rust
Eglin Air Force Base, FL	1951	1954	Testing of Hog Cholera Virus	Hog cholera virus
Granite Peak Installation at Dugway, UT	1943	1945	Munition trials	Bacillus anthracis
Horn Island, MS	1943	1945	Munition trials	Botulinum toxin, Bacillus globigi

Facility / Location	Year activated	Year deactivated	Activity	Agent/disease
Madison, WI	1951	1954	Testing of Newcastle disease on poultry	Newcastle disease
Marshall Islands	1968	Not given	Trials on biological decay and dissemination in open air field trials	Coxiella burnetti, Francisella tularensis, Staphylococcus enterotoxin B
Off the Coast of Norfolk, Atlantic Ocean	1950	1950	Outdoor field trials of vulnerabilities and modern detection systems	Bacillus globigii, Serratia marcescens
Pine Bluff, AK	1950	1972	Large scale production	Brucella suis, Francisella tularensis, Clostridium botulinum, Coxiella burnetii, venezuelan equine encephalomyelitis, Bacillus anthracis, Staphylococcus enterotoxin B
Pine Camp, NY	1950	Not given	Anti-plant agent testing	Cereal pathogens
Plum Island, Camp Terry, NY	1950-51	1954	Anti-animal agent testing	Not given
Rocky Mountain Arsenal, CO	1969	1971-73	Wheat stem rust storage	Wheat stem rust
San Francisco, CA	1950	1950	Large area vulnerability testing using simulant organisms and fluorescent particles	Bacillus globigii, Serratia marcescens and fluorescent particles
Vigo Ordnance Plant, Terre Haute, IN	1944	1945	Production	Bacillus globigii, Bacillus anthracis
Virgin Islands	1954	1957	Large scale field trials with wheat stem rust	Wheat stem rust

According to open sources, models and scenarios for BW use had been developed at the beginning of the programme, suggesting the use of BW in concurrence with a nuclear weapon against civilian targets in order to completely paralyze an enemy. The hypothetical use of incapacitating agents in any potential NATO actions was envisioned and a detailed plan involving BW was constructed for an invasion of Cuba. In 1962, a study detailed strategies for BW use in wars fought in Berlin, Laos, the Formosa Strait Islands and Korea. These military strategies are not covered in the CBM.

Summary

The CBM provides a comprehensive description of activities conducted during the US BW programme. This declaration is the most accurate and complete declaration submitted by any country. Open sources provide some details on testing and military doctrine that are not covered in the CBM. The USA is the only country that has submitted updates of their CBM as new information became available.²³ Table 10 summarizes the level of transparency provided for the different activities in the US past offensive BW programme.

Table 10: Transparency regarding the US past offensive BW programme

Admin.	Research	Developm.	Testing	Production	Stockpiling	Mil. doctrine	Conversion
Black boxes –	No transparency; information on the particular activity is missing or appears contradictory to open sources.						
Grey boxes –	Medium level of transparency; the particular activity is mentioned as having taken place (or not taken place), but no detail is provided or important detail is missing.						
White boxes –	High level of transparency; detailed information on the particular activity is provided.						

3. CONCLUSION AND RECOMMENDATIONS

Until 2003, six countries had submitted information on past offensive BW programmes using the CBM Form F: Canada, France, Iraq, Russia, United Kingdom and USA. South Africa, which also had a BW programme, did not provide information on its previous attempts to weaponise biological agents. The analysis above shows, that there is a significant degree of variation in the declarations on past offensive BW programmes. The variations relate to the length, level of detail, accuracy and completeness of the CBM Form F submissions. The varying degree of accuracy and completeness reflects the degree of transparency a given country has chosen to provide on its past offensive activities. In this paper we did not attempt to investigate the underlying cause for the lack of transparency in any given country. It could be a lack of commitment or effort to compile all the data, or a sign of an intentional effort to mislead BWC member states, or a mix of both. Table 11 summarizes the level of transparency provided for the different activities in the past offensive BW programmes.

²³ In 1995, a number of M114 bombs containing *Brucella suis* were unearthed at Wright-Patterson Air Force base, Ohio. Relevant updates in the CBM Form F submission followed in 1996 and 1997 in the defensive section.

Table 11: Level of transparency provided for the different activities in the past offensive BW programmes of states

Activity	Canada	France	Iraq	Russia	South Africa	United Kingdom	USA
Administration	Black	Black	Black	Black	Black	Black	White
Research	Grey	Grey	White	Grey	Black	Grey	White
Development	Grey	Grey	White	Black	Black	Black	White
Testing	Grey	Grey	Black	Grey	Black	Grey	Black
Production	*	Grey	White	Black	Black	Grey	White
Stockpiling	*	Grey	Black	Black	Black	Grey	White
Military doctrine	Black	Black	Black	Black	Black	Black	Black
Conversion	Black	Black	Black	Black	Black	Black	White

Black boxes – No transparency; information on the particular activity is missing or appears contradictory to open sources.
 Grey boxes – Medium level of transparency; the particular activity is mentioned as having taken place (or not taken place), but no detail is provided or important detail is missing.
 White boxes – High level of transparency; detailed information on the particular activity is provided.
 * Production and stockpiling in Canada are afforded the highest level of transparency because neither has occurred.

As Table 11 shows, there is not necessarily a correlation between a consistent, longstanding and active support for the BWC and a high level of transparency in regard to past activities. Providing only a limited level of transparency or no transparency at all undermines the CBMs and puts into question the commitment of a state to the full implementation of the BWC. South Africa, which has officially admitted to having had a past BW programme, has not provided any information in the CBM submission. Russia mentions a number of aspects of the Soviet BW programme in its CBM submission but provides a misleading impression of the aim and size of this programme. The United Kingdom mentions most of the activities conducted during the UK's BW programme in either the declaration on offensive or the declaration on defensive activities, but provides little detail on these activities, and their intentions remain somewhat unclear. Canada's CBM description of its past offensive BW programme is overly simple and incomplete; substantial information regarding the offensive activities which were carried out within Canadian borders is missing. France's CBM description of its past offensive BW programme gives a very general description of the activities conducted, but provides little detail. Iraq declared in 1993 and 1995 that it did not have a past BW programme. The last CBM Form F was submitted at a time when Iraq had finally decided to acknowledge the existence of a large-scale BW programme and provided detailed information to UN inspectors. The CBM reflects this information with some minor omissions. The USA's CBM provides a comprehensive description of activities conducted during the US BW programme. It is by far the most accurate and complete declaration submitted by any country.

Providing sufficient information on past activities is paramount to building confidence in the peaceful nature of activities that a country engages in today. A large part of building this confidence falls on the CBMs because they are the only multilaterally accepted transparency mechanism in the field of biological arms control. For them to function efficiently, all BWC member states have to participate regularly and submission quality has to be improved. One way to help improve the quality of submissions is to assess, and if necessary revise, the individual CBM forms. In regard to the offensive part of CBM Form F, which is the sole focus of this paper, the following recommendations can be deduced from the analysis above:

- Encourage new submissions: South Africa has officially, but not in the form of a CBM Form F submission, admitted to a past offensive BW programme. Being a country of strong influence in the region, South Africa should be encouraged to submit a comprehensive CBM Form F declaration. There are also countries which have been accused of engaging in BW development in official BWC contexts. These states should be encouraged to use CBM Form F to state the existence or non-existence of past programmes, explain activities that might create suspicion and initiate a dialogue on these issues.
- Maintain open-answer format: One of the advantages of CBM Form F is that the answer takes the form of a narrative. Obligating the author to compose a narrative and thereby consider the relevance of information forces greater thought to be invested in the process. Replacing this open-answer format with a “yes/no” or tick box format would limit the possibilities to produce a detailed and comprehensive report.
- Cover all aspects of the past BW programme: The following seven categories of activities have been identified in the past as essential for developing a national BW capacity: 1) administration 2) research, 3) development, 4) field testing, 5) production, 6) stockpiling, and 7) military doctrine. When considering past activities, an eighth category becomes relevant – conversion, i.e. the way the BW programme was terminated and relevant activities and facilities were destroyed or converted. While maintaining an open-answer format, countries should be encouraged to provide information on these eight broad categories. This would also guide the author in compiling a complete narrative.
- Promote updates: Most of the countries whose CBM submissions have been analysed in this paper have only submitted one Form F or have submitted the same Form F year after year, regardless of events that have taken place since 1992. States should be encouraged to provide regular updates – e.g. every five years - of Form F submissions. These updates should include newly declassified information, correct omissions that have been identified, or incorporate any other information that may be considered relevant.
- Encourage discussion: It is likely that even a fully transparent and comprehensive CBM submission leaves some questions open. In order to resolve such questions thereby increasing confidence in the completeness and accuracy of CBM submissions, a dialogue platform to informally discuss CBM submissions should be created. Discussions on CBM Form F would be an ideal starting point to such a dialogue platform as it relates to past activities, which have already been abandoned.

It is clear that CBMs will play an increasingly vital role in biological arms control as no other transparency mechanism is likely to emerge soon. The Sixth BWC Review Conference at the end of 2006 represents an opportunity to make intelligent changes to the CBM. This opportunity must be taken because allowing the CBMs to further erode in participation and quality would weaken the international community’s ability to prevent the proliferation of biological weapons. The CBM regime must be assessed as a whole and improvements must be made across the board. This concerns firstly, the evaluation of existing CBM topics in terms of addition and deletion? Secondly, the formats for the individual topics need to be examined and if necessary amended accordingly. Similar studies to this one should be conducted for the other Forms in the CBM. Thirdly, the organisational process behind the CBM mechanism needs to be assessed. The only activity the United Nations Department for Disarmament Affairs is currently mandated with is the collection, copying and distribution of CBM declarations. No structure or capacity

for translation, analysis, technical assistance and follow-up exist. The only form of assistance is a guide for the completion of the CBMs, developed by the Canadian government.²⁴ Finally, and perhaps, most importantly, the importance of CBM participation has to be continuously emphasized. Transparency and greater confidence in the mechanism will only be achieved when universal participation occurs.

²⁴ This guide is hosted by the University of Bradford and is available on the internet at http://www.opbw.org/cbms/Guide_files/v3_document.htm

ANNEX I
LIST OF DOCUMENTS CONTAINING THE CBM SUBMISSIONS
1992-2003

Document	Containing CBM submissions of year
DDA/4-92/BWIII DDA/4-92/BWIII/Add.1 DDA/4-92/BWIII/Add.2 DDA/4-92/BWIII/Add.3 DDA/4-92/BWIII/Add.4 BWC/CONF.III/VEREX/NONE.26	1992
ODA/9-93/BWIII ODA/9-93/BWIII/Add.1 ODA/9-93/BWIII/Add.2	1993
CDA/16-94/BWIII CDA/16-94/BWIII/Add.1 CDA/16-94/BWIII/Add.2	1994
CDA/14-95/BW-III CDA/14-95/BWIII/Add.1 CDA/14-95/BW-III/Add.2 CDA/14-95/BW-III/Add.3	1995
CDA/11-96/BW-III CDA/11-96/BW-III/Add.1 11-96/CDA/BW-III/Add.II	1996
CDA/BWC/1997/CBM CDA/BWC/1997/CBM/Add.1	1997
DDA/BWC/1998/CBM DDA/BWC/1998/CBM/Add.1	1998
DDA/BWC/1999/CBM DDA/BWC/1999/CBM/Add.1 DDA/BWC/1999/CBM/Add.2 DDA/BWC/1999/CBM/Add.3	1999
DDA/BWC/2000/CBM DDA/BWC/2000/CBM/Add.1 DDA/BWC/2000/CBM/Add.2 DDA/BWC/2000/CBM/Add.3	2000
DDA/BWC/2001/CBM DDA/BWC/2001/CBM/Add.1 DDA/BWC/2001/CBM/Add.2 DDA/BWC/2001/CBM/Add.3	2001
DDA/BWC/2002/CBM DDA/BWC/2002/CBM/Add.1 DDA/BWC/2002/CBM/Add.2 DDA/BWC/2002/CBM/Add.3	2002

Document	Containing CBM submissions of year
DDA/BWC/2003/CBM DDA/BWC/2003/CBM/Add.1 DDA/BWC/2003/CBM/Add.2	2003

ANNEX II

SUMMARY OF ALL CBM FORM F SUBMISSIONS, BOTH OFFENSIVE AND DEFENSIVE²⁵

The following table summarizes in a very general way the content of all CBM Form F submissions made between 1992 and 2003. The first column for each year indicates the information provided on past activities in CBM Form 0. Form 0 consists of tick boxes for each CBM topic, through which countries can indicate whether for a particular topic there is 1) nothing to declare (ND), 2) nothing new to declare (NN), or 3) if left un-ticked a declaration is made (Y). Some countries, such as Canada, did not provide CBM Form 0 (NF). Some countries, such as Bulgaria in 1992 and 1994, left the tick boxes in CBM Form 0 blank, but still did not provide a CBM Form F. The second to fourth column for each year indicate the information provided on past activities in CBM Form F. If a CBM Form F was submitted in the particular year, the submission column (Subm) contains a Yes (Y). If a CBM Form F was not submitted in the particular year, the submission column contains a No (N). The third and fourth columns indicate with Yes (Y) or No (N) whether a past offensive BW programme (Off) and/or a past defensive BW programme (Def) were declared or not. If a year is given in the third and/or fourth columns for each year, this indicates the year that the very same declaration was made for the first time. For example, Australia submitted the same CBM Form F declaration in 1992, 1993 and 1994. Grey boxes indicate, that no CBM was submitted.

Country	Year of BWC entry	1992			1993			1994			1995			1996			1997								
		Form 0	Form F			Form 0	Form F			Form 0	Form F			Form 0	Form F			Form 0	Form F						
			Subm	Off	Def		Subm	Off	Def		Subm	Off	Def		Subm	Off	Def		Subm	Off	Def				
Argentina	1979	ND	N		ND	N		NN	N		NF	N		NF	Y	N	N	NN	N						
Armenia	1994																	NF	N						
Australia	1977	Y	Y	N	N	Y	Y	N	1992	Y	Y	N	1992	Y	Y	N	Y	NN	N		NN	Y	N	1995	
Austria	1975	NF	N			ND	N			ND	N			ND	N			ND	N		ND	N			
Bangladesh	1985	NF	N															NF	N						
Belarus	1975	ND	Y	N	N	ND	N							ND	N			NF	Y	N	N	NN	N		
Belgium	1979	NF	N															NF	N			NF	N		

²⁵ Utmost care has been used in analysing the large amounts of data on which this annex is based. Should readers, nevertheless, identify mistakes, the author would be grateful for receiving notice at nicolas.isla@uni-hamburg.de.

Country	Year of BWC entry	1992				1993				1994				1995				1996				1997			
		Form 0	Form F			Form 0	Form F			Form 0	Form F			Form 0	Form F			Form 0	Form F			Form 0	Form F		
			Subm	Off	Def		Subm	Off	Def		Subm	Off	Def		Subm	Off	Def		Subm	Off	Def		Subm	Off	Def
Germany	1983	NF	Y	N	Y	NN	N			NN	N			NN	N			NN	N			NN	N		
Greece	1975									NF	N			NF	N										
Hungary	1975	Y	Y	N	N	NN	N			NN	N			NN	N			NN	N			NN	N		
Iceland	1975					NF	N			NF	N														
India	1975																					NF	Y	N	Y
Iran	1975																								
Iraq	1991					ND	Y	N	Y					NN	N			Y	Y	Y	N	NN	N		
Ireland	1975					ND	N							NF	N			ND	N			ND	N		
Italy	1975					ND	Y	N	Y	ND	N			ND	N			ND	N			NN	Y	N	Y
Japan	1982	ND	N			ND	Y	N	N	ND	Y	N	N	NN	Y	N	N	ND	Y	N	N	NN	Y	N	N
Jordan	1975	NF	N											NF	N			NF	N						
Kuwait	1975																	NF	N						
Kyrgyzstan	2004					NF	N																		
Laos	1975													NF	N										
Liechtenstein	1991																								
Lithuania	1998																								
Luxembourg	1976									ND	N											ND	N		
Mali	2002																								
Malta	1975	NF	N							NF	N			NF	N			ND	N						
Mexico	1975	ND	N							ND	N							NF	N						
Mongolia	1975	NF	N			ND	Y	N	N	ND	N			ND	N										
Netherlands	1975	Y	Y	N	Y	NN	Y	1992	1992	NN	Y	N	1992	NN	N			NN	Y	N	1992	NN	Y	N	1992
New Zealand	1975	ND	N			ND	N							ND	N			ND	N			ND	N		
Nicaragua	1975					NF	N																		
Norway	1975	NN	Y	N	Y	NN	Y	N	1992	NN	N			NN	Y	N	Y	NN	Y	N	N	NN	Y	N	1996

Country	Year of BWC entry	1992				1993				1994				1995				1996				1997				
		Form 0	Form F			Form 0	Form F			Form 0	Form F			Form 0	Form F			Form 0	Form F			Form 0	Form F			
			Subm	Off	Def		Subm	Off	Def		Subm	Off	Def		Subm	Off	Def		Subm	Off	Def		Subm	Off	Def	
Papa New Guinea	1980															NF	N									
Paraguay	1976													NF	N											
Peru	1985	ND	N																							
Poland	1975								Y	Y	N	Y	NN	N					NN	N	N	1994	NN	N		
Portugal	1975								NF	N			NF	N					NF	N						
Qatar	1975												NF	N					NF	N						
Republic of Korea	1987					ND	N			ND	N			ND	Y	N	N	ND	Y	N	N	NF	Y	N	N	
Romania	1979	NF	N			NF	N			NF	N			NF	N			NF	N			ND	N			
Russia	1975	Y	Y	Y	Y	NN	N			NN	N			NN	N			NN	N			NN	N			
Saint Lucia	1986												Y	N												
San Marino	1975												NF	N				NF	N			NF	N			
Saudi Arabia	1975																	NF	N			NF	N			
Seychelles	1979								NF	N																
Slovak Republic ²	1975								NF	N			ND	N				ND	N			ND	N			
Slovenia	1992					ND	N			ND	N			NF	N			NF	N			NF	N			
South Africa	1975					Y	Y	N	Y					NN	Y	N	Y	NN	N			NN	N			
Spain	1979	NN	N			ND	N			ND	N			ND	N			ND	N			Y	N			
Sri Lanka	1986									ND	Y	N	N													
Sweden	1976	Y	Y	N	Y	NN	Y	N	1992	NN	N			NN	N			NN	N			NN	N			
Switzerland	1976	ND	Y	N	N	NN	N			ND	N			ND	N			ND	N			ND	N			
Thailand	1975	ND	Y	N	N																					
Tunisia	1975	ND	Y	N	N																					
Turkey	1975					ND	N			ND	N			ND	N			ND	Y	N	N	ND	N			

Country	Year of BWC entry	1992				1993				1994				1995				1996				1997																			
		Form 0	Form F			Form 0	Form F			Form 0	Form F			Form 0	Form F			Form 0	Form F			Form 0	Form F																		
			Subm	Off	Def		Subm	Off	Def		Subm	Off	Def		Subm	Off	Def		Subm	Off	Def		Subm	Off	Def																
Uganda	1992																	NF	N																						
Ukraine	1975	NF	Y	N	N	NN	Y	1992	1992					NF	N			NN	Y	1992	1992	ND	Y	1992	1992																
United Kingdom	1975	Y	Y	Y	Y	NN	Y	1992	1992	NN	N			NN	N			NN	N			NN	N																		
USA	1975	Y	Y	Y	Y	NN	Y	1992	1992	NN	Y	Y	Y	Y	Y	1994	1994	Y	Y	Y	Y	Y	Y	Y	Y																
Uzbekistan	1996																																								
Yugoslavia	1975	NF	N																																						

Country	Year of BWC Entry	1998				1999				2000				2001				2002				2003																								
		Form 0	Form F			Form 0	Form F			Form 0	Form F			Form 0	Form F			Form 0	Form F			Form 0	Form F																							
			Subm	Off	Def		Subm	Off	Def		Subm	Off	Def		Subm	Off	Def		Subm	Off	Def		Subm	Off	Def																					
Argentina	1979	NN	N			NN	N			NN	N			NN	N			ND	Y	N	N	ND	Y	2002	2002																					
Armenia	1994	NF	N			NF	N							NF	N								NF	N																						
Australia	1977	NN	Y	1995	1995	NN	Y	1995	1995	NN	Y	1995	1995	NN	Y	N	N	NN	Y	2001	2001	NN	Y	2001	2001																					
Austria	1973	ND	N			ND	N			ND	N			ND	N			ND	N																											
Bangladesh	1985																																													
Belarus	1975					ND	N			ND	Y	N	N	ND	Y	2000	2000	ND	Y	2000	2000	ND	N																							
Belgium	1979					NF	N			NF	N			NF	N			NN	N																											
Belize	1986																						ND	Y	N	N																				
Bhutan	1978																																													
Bolivia	1975																																													
Brazil	1975					ND	N							ND	N			ND	N																											
Bulgaria	1975	ND	N							ND	N			Y	Y	N	Y	NN	Y	N	N	NN	N																							
Canada	1972	NF	Y	1992	1992	NF	Y	1992	1992	NF	Y	1992	1992	NF	Y	1992	1992	NF	Y	1992	1992	NN	N																							
Chile	1980	NN	Y	N	N					ND	Y	N	N	NN	Y	2000	2000	NN	Y	2000	2000																									

Country	Year of BWC Entry	1998				1999				2000				2001				2002				2003			
		Form 0	Form F			Form 0	Form F			Form 0	Form F			Form 0	Form F			Form 0	Form F			Form 0	Form F		
			Subm	Off	Def		Subm	Off	Def		Subm	Off	Def		Subm	Off	Def		Subm	Off	Def		Subm	Off	Def
China	1984	NN	N			NN	N			NN	N			NN	N			NN	N			NN	N		
Colombia	1983	NF	Y	N	N																				
Costa Rica	1975									NF	N			NF	N										
Croatia	1999					Y	N			Y	Y	N	N												
Cuba	1976	NN	N			NN	N			NN	N			NN	N			NN	N			NN	N		
Cyprus	1975																								
Czech Republic	1993	NN	Y	N	Y	NN	N			NN	N			NN	N			NN	N			NN	N		
Czechoslovakia ²⁷	1975																								
Denmark	1975																								
Ecuador	1975																								
Estonia	1993	ND	N			ND	N			ND	N			NN	N							ND	N		
Fiji	1975																								
Finland	1975	ND	N			ND	N			ND	N			ND	N			ND	N			ND	N		
France	1984	NN	N			NN	N			NN	N			NN	N			NF	N						
Georgia	1996									ND	N							ND	N			ND	Y	N	N
Germany	1983	NN	N			NN	N			NN	N			NN	N			NN	N			NN	N		
Greece	1975																								
Hungary	1972	NN	N			NN	N			NN	N			NN	N										
Iceland	1975																								
India	1975																								
Iran	1975	NF	N			NF	N											ND	Y	N	N				
Iraq	1991																								
Ireland	1972																	ND	Y	N	N				

²⁷ Submitted only once as Czechoslovakia in 1992, then as separate states, Czech Republic and Slovakia.

Country	Year of BWC Entry	1998				1999				2000				2001				2002				2003			
		Form 0	Form F			Form 0	Form F			Form 0	Form F			Form 0	Form F			Form 0	Form F			Form 0	Form F		
			Subm	Off	Def		Subm	Off	Def		Subm	Off	Def		Subm	Off	Def		Subm	Off	Def		Subm	Off	Def
Italy	1975	NN	Y	1997	1997	NN	Y	1997	1997	NN	Y	1997	1997	NN	Y	1997	1997	NN	Y	1997	1997	NN	Y	1997	1997
Japan	1982	ND	Y	N	N	Y	Y	N	N	Y	Y	N	N	NN	Y	1999	1999	Y	Y	1999	1999	NN	Y	1999	1999
Jordan	1975																								
Kuwait	1975																								
Kyrgyzstan	2004																								
Laos	1975																								
Latvia	1997																	NF	Y	N	N				
Liechtenstein	1991													NN	N			NN	N						
Lithuania	1998									ND	Y	N	N	ND	Y	2000	2000	ND	N			ND	N		
Luxembourg	1976	NF	N																						
Mali	2002	NF	N																						
Malta	1975	NF	N							NF	N														
Mexico	1975																								
Mongolia	1972																								
Netherlands	1981	NN	Y	N	1992	Y	Y	N	Y	NN	N			NN	Y	N	Y	Y	Y	2001	2001	NF	Y	N	Y
New Zealand	1972	ND	N			ND	N			ND	N			ND	N			ND	N			ND	N		
Nicaragua	1975																								
Norway	1973	NF	Y	N	1996	NN	Y	1996	1996	NN	Y	1996	1996	NN	Y	1996	1996	NN	Y	1996	1996	NN	Y	1996	1996
Papa New Guinea	1980																								
Paraguay	1976																								
Peru	1985																	ND	N						
Poland	1975	NN	Y	N	N	NN	N							NN	N			ND	N			ND	N		
Portugal	1975																								
Qatar	1975	NF	N																						

Country	Year of BWC Entry	1998				1999				2000				2001				2002				2003			
		Form 0	Form F			Form 0	Form F			Form 0	Form F			Form 0	Form F			Form 0	Form F			Form 0	Form F		
			Subm	Off	Def		Subm	Off	Def		Subm	Off	Def		Subm	Off	Def		Subm	Off	Def		Subm	Off	Def
Republic of Korea	1987	ND	Y	N	N	ND	Y	1998	1998	ND	Y	1998	1998	ND	Y	1998	1998	ND	Y	1998	1998	ND	Y	1998	1998
Republic of Seychelles	1979																								
Romania	1979	ND	N			ND	N			ND	N			ND	N			ND	N			ND	N		
Russian Federation	1975	NN	N			NN	N			NN	N			NN	N			NN	N			NN	N		
Saint Lucia	1986																								
San Marino	1975									NF	N			NF	N										
Saudi Arabia	1975																								
Slovakia	1975	ND	N			ND	N			ND	N			ND	N			ND	N			ND	N		
Slovenia	1992	NF	N			NF	N			NF	N							NF	N						
South Africa	1975	NN	N			NN	N			NN	N							NN	N			NN	N		
Spain	1979	NN	N			NN	N			NN	N			NN	N			NN	N			NN	N		
Sri Lanka	1986																								
Sweden	1976	NN	N			NN	N			NN	N			NN	N										
Switzerland	1976	ND	N			ND	N			ND	N			Y	Y	N	Y	NN	Y	2001	2001	NN	N		
Tunisia	1975									NF	N														
Turkey	1975	ND	N			ND	N			ND	N			ND	N			ND	N			ND	N		
Uganda	1992																								
Ukraine	1975	NN	N			NN	Y	1992	1992					NN	Y	1992	1992	NN	Y	1992	1992	NN	Y	1992	1992
United Kingdom	1975	NN	N			NN	N			NN	N							NN	N			NN	N		
USA	1975	NN	N			NN	N			NN	N			NN	N			NN	N			NN	N		
Uzbekistan	1996	NF	N			ND	Y	N	N					ND	N			ND	Y	N	N	NN	Y	N	N
Yugoslavia	1975																								

