ATOMIC ACCOUNTING

A New Estimate of Russia's Non-Strategic Nuclear Forces

Igor Sutyagin

RUSI
www.rusi.org

Royal United Services Institute

OCCASIONAL PAPER

About RUSI

The Royal United Services Institute (RUSI) is an independent think tank engaged in cutting edge defence and security research. A unique institution, founded in 1831 by the Duke of Wellington, RUSI embodies nearly two centuries of forward thinking, free discussion and careful reflection on defence and security matters.

For more information, please visit: www.rusi.org

Occasional Paper, November 2012

Atomic Accounting

A New Estimate of Russia's Non-Strategic Nuclear Forces

Igor Sutyagin

www.rusi.org

The views expressed in this paper are the author's own, and do not necessarily reflect those of RUSI or any other institutions with which the author is associated.

Comments pertaining to this report are invited and should be forwarded to:
Dr Igor Sutyagin, Research Fellow, Russian Studies, Royal United Services Institute, Whitehall, London, SW1A 2ET, United Kingdom, or via email to igors@rusi.org

About RUSI Publications
Director of Publications: Adrian Johnson
Production Editor: Ashlee Godwin

Paper or electronic copies of this and other reports are available by contacting publications@rusi.org.

Printed in the UK by Stephen Austin and Sons, Ltd.

Contents

Acknowledgements

This study is an integral part of a wider effort currently being carried out by RUSI on Russia's military capabilities. The analysis contained within draws heavily upon both the personal experiences and knowledge of the author, who was an air-defence officer in the Soviet armed forces and a former head of section within the Russian Academy of Sciences, as well as upon other elements of RUSI's wider studies.

The author would like to thank the many colleagues who contributed their time generously in the refinement of this study, including Andrea Berger, Professor Malcolm Chalmers and Ashlee Godwin of RUSI. Particular thanks are due to Dr Pavel Podvig, Dr Otfried Nassauer, Hans M Kristensen and Dr Nikolai Sokov. Their insightful comments played an integral part in the formation of this paper. The author would also like to thank Dr Rebecca Johnson of the ACRONYM Institute for Disarmament Diplomacy for playing a role in inspiring this study.

Finally, the author would like to extend very special thanks to Hugh Chalmers of RUSI, whose passionate editorial efforts helped shape this text.

Editor's Note

In the interests of brevity and clarity for a Western readership, NATO designations for Russian military systems are used throughout this study. A NATO-Russian designation comparison can be found in Appendix 4.

Acronyms and Abbreviations

ABM	Anti-ballistic missile
ACDA	Arms Control and Disarmament Agency (US)
ADS	Air-defence system
ASM	Anti-ship missile
ASW	Anti-submarine warfare
BMD	Ballistic missile defence
CGN	Nuclear guided-missile cruiser
CV	Aircraft carrier
CVBG	Carrier battlegroup
DDG	Guided-missile destroyer
ECM	Electronic countermeasures
FFG	Guided-missile frigate
GUMO	Main Directorate of the Russian Ministry of Defence
ICBM	Intercontinental ballistic missile
NATO	North Atlantic Treaty Organisation
NPT	Nuclear Non-Proliferation Treaty
NSNW	Non-strategic nuclear weapons
PNI	Presidential Nuclear Initiative
RUSI	Royal United Services Institute for Defence and Security Studies
SAM	Surface-to-air missile
SEAD	Suppression of enemy air defence
SIPRI	Stockholm International Peace Research Institute
SLBM	Submarine-launched ballistic missile
SLCM	Submarine-launched cruise missile
SS	Submarine
SSBN	Nuclear ballistic-missile submarine
SSGN	Nuclear guided-missile submarine
SSN	Nuclear submarine
START	Strategic Arms Reduction Treaty
US	United States of America
USSR	Union of Soviet Socialist Republics

Introduction and Summary

THE purpose of this study is to develop and implement a new, replicable methodology for estimating the composition and size of Russia's operational non-strategic nuclear stockpile.

As Russia's strategic nuclear forces have been drawn down in parallel with those of the US, its stockpile of non-strategic nuclear weapons (NSNW) has begun to play a greater role in the arms-control policies of Western states. The US Senate, in its instrument of ratification of the New START treaty in December 2010, urged the president 'to seek to initiate, following consultation with NATO allies … negotiations with the Russian Federation on an agreement to address the disparity between the non-strategic (tactical) nuclear weapons stockpiles of the Russian Federation and of the United States and to secure and reduce tactical nuclear weapons in a verifiable manner.'[1] NATO subsequently declared, eighteen months later, that it was prepared to consider 'further reducing its requirement for non-strategic nuclear weapons in the context of reciprocal steps by Russia, taking into account the greater Russian stockpiles of non-strategic nuclear weapons stationed in the Euro-Atlantic area.'[2]

While decades of verified strategic force reductions have given the US and Russia a relatively clear picture of each other's strategic forces, NSNW have never been subject to any verifiable agreement or transparency regime. The only widely referenced unofficial estimates of Russia's non-strategic stockpile suggest that it may be significantly larger, quantitatively, than that of the US, or indeed any other nuclear-weapon state.[3] Yet the sources and methods used to develop these estimates can often be rather opaque; and, as this paper argues, these estimates may significantly overestimate the number of Russia's operationally assigned NSNW.

The methodology in this paper rests upon three key definitions and assumptions. First, Russia's 'operationally assigned' NSNW are defined as those that have been assigned to available delivery systems, and could thus reasonably be available for use within the constraints of a general nuclear war. Other 'reserve' warheads are held back from dismantlement to meet envisioned medium-to-long-term requirements, but cannot immediately play a significant part in any short-notice nuclear conflict. Secondly, rather than being assigned to individual delivery vehicles, NSNW are assigned on a *unitary basis*. The number of operationally assigned NSNW is therefore dictated by the number of nuclear-capable units within Russia's armed forces, and by the nuclear tasks they are expected to execute. These unitary assignments are inflexible and do not change from peacetime to wartime. Finally, while the number of delivery systems may vary between units, each

unit's nuclear tasks, and therefore its assignment of nuclear warheads, remains constant.

To develop a new estimate of Russia's non-strategic nuclear forces, this study draws from open-source information to sketch 'assignment rules' for nuclear-capable elements of Russia's land, sea, air and air-defence forces. Sources include historical warhead-assignment standards, changes in Russian military capabilities and systems, Russian threat perceptions and projected battlefield environments, and current procurement and research activities. Applying these contemporary assignment rules to available data regarding Russia's nuclear-capable military systems, and the related military structures, suggests that, as of mid-2012, Russia maintains approximately 1,000 operationally assigned non-strategic nuclear warheads (see Table 1). This represents a significantly lower number of operationally assigned and deliverable non-strategic nuclear warheads than previously postulated. Other publicly available estimates, by contrast, have previously indicated that Russia maintains a stockpile of approximately 2,000 operationally assigned non-strategic nuclear weapons.

Table 1: A New Estimate of Russia's Operationally Assigned NSNW Warheads.

	Warheads in				
Armed Service	**Western Russia**	**Southern Russia**	**Central Russia**	**Eastern Russia**	**Total Operationally Assigned Warheads**
Ground Forces	48–80	20–30	24–36	36–64	128–210
Naval Forces	175	20	0	135	330
Air Forces	210	36	52	36	334
Air-Defence Forces	68–128	0–6	0–15	0–17	68–166
TOTAL					**860–1,040**

Source: Author's calculations.

Retrospective testing of this methodology against what few official or semi-official statements exist regarding Russia's non-strategic stockpile suggests it may be relatively accurate. The application of NSNW assignment rules to independent estimates of Russia's nuclear-capable forces in 1988, 1991 and 2005 produces estimates for trends in NSNW stockpiles that are fully consistent with official statements;[4] for example, that there was a 75 per cent decrease in Russia's total NSNW arsenal between 1991 and 2005 (see Appendix 2).[5]

This retrospective test also shows that the size of Russia's operationally assigned NSNW stockpile, as well as its overall NSNW stockpile, has continued to decline, as Table 2 below shows. The current NSNW stockpile is only one-tenth of that of the Soviet Union at the end of the Cold War, and has declined

by around 50 per cent even in the last seven years. These trends parallel the deep reductions in the number of US NSNW warheads over the same period.

Table 2: The Decline of Russia's NSNW Stockpile, 1988–2012.

Year	Estimate of Operationally Assigned Warheads	Estimate of Overall Stockpile
1988 (Soviet Union)	≈12,500	≈20,400
1991	≈7,900	≈13,000
2005	≈ 2,000	≈3,300
2012	≈1,000	≈ 1,900

Source: Author's calculations.

These estimates also suggest, therefore, that the perceived numerical disparity between the number of US and Russian non-strategic nuclear warheads may not be as large as previously thought. In total, Russia may hold a global advantage of only a few hundred assigned non-strategic warheads over the US (a number that is comparable to the advantage held by the US in terms of *strategic* warheads onboard missiles or bombers that are counted under the New START treaty).

Moreover, just as a significant proportion of US NSNW are not deployed in Europe, this study suggests that approximately 45 per cent of Russia's operationally assigned NSNW are associated with forces outside of western Russia (see Appendix 3). The study's conclusion also suggests that Russia may possess a reserve stockpile of approximately 900 NSNW that cannot immediately contribute to a short-notice nuclear exchange, but nor are they awaiting dismantlement.

In terms of size and distribution, therefore, US and Russian non-strategic nuclear stockpiles may be more similar than previously thought. However, in terms of operational philosophy, the two remain very different. While NATO appears to envisage only a limited set of roles for its own NSNW, Russia still envisions utilising non-strategic nuclear weapons in a wider range of scenarios and against a wider range of targets.

Notes and References

1. US State Department, 'New START Treaty: Resolution of Advice and Consent to Ratification', December 2010, para. 12, <http://www.state.gov/documents/organization/154123.pdf>, accessed 24 October 2012.

2. NATO, 'Deterrence and Defence Posture Review', press release issued 20 May 2012, para. 26, <http://www.nato.int/cps/en/natolive/official_texts_87597.htm>, accessed 24 October 2012.

3. See for example: Hans M Kristensen and Robert S Norris, 'Nonstrategic Nuclear Weapons, 2012', *Bulletin of the Atomic Scientists* (No. 68, Vol. 5, September/October 2012); Shannon N Kile et al., 'World Nuclear Forces', in *SIPRI Yearbook 2012: Armaments, Disarmaments and International Security* (Oxford: Oxford University Press, 2012).

4. For independent estimates of Russia's nuclear-capable forces at these dates see: *The Military Balance 1988–89*, *The Military Balance 1991–92*, and *The Military Balance 2005–06*, published by the International Institute for Strategic Studies.

5. Hans M Kristensen, 'Non-Strategic Nuclear Weapons', Special Report No. 3, Federation of American Scientists, May 2012, p. 49, <http://www.fas.org/_docs/Non_Strategic_Nuclear_Weapons.pdf>, accessed 29 October 2012.

I. Existing Estimates of Russia's NSNW Potential

AT present, the most commonly cited estimates regarding Russia's stockpile of non-strategic nuclear weapons are contained within the *Bulletin of the Atomic Scientists*' 'Nuclear Notebooks' series and the Stockholm International Peace Research Institute's (SIPRI) 'World Nuclear Forces', within its annual yearbook.[1] Hans M Kristensen, director of the Nuclear Information Project within the Federation of American Scientists, is a key contributor to both of these, being the primary author of the former and a contributing author of the latter. While the estimates are set out with varying levels of detail, both generally support the conclusion that Russia maintains approximately 2,000 non-strategic nuclear warheads assigned to operational delivery vehicles.

In addition to these 'operationally assigned' warheads, the 'Nuclear Notebook' series states that there are 'several thousand' retired warheads awaiting dismantlement and 'World Nuclear Forces 2012' estimates that there are 2,000 warheads in reserve awaiting dismantlement. An alternative formulation for this total stockpile, given by the US Assistant Secretary of Defense for Global Strategic Affairs Madelyn Creedon, quoting public sources, is between 2,000 and 4,000 non-strategic warheads.[2]

Table 3: Present Estimates of Russian Operationally Assigned NSNW Stocks.

	'Nuclear Notebook'	'World Nuclear Forces'	New Estimate
Ground Forces	≈170	≈164	128–210
Naval Forces	≈700	≈700	330
Air Forces	≈730	≈730	334
Air-Defence Forces	≈300-400	≈425	68-166
TOTALS	**≈2,000**	**≈2,000**	**860–1,040**

Source: Hans M Kristensen and Robert S Norris, 'Nonstrategic Nuclear Weapons, 2012', Bulletin of the Atomic Scientists *(No. 68, Vol. 5, September/October 2012); Shannon N Kile et al., 'World Nuclear Forces', in* SIPRI Yearbook 2012: Armaments, Disarmaments and International Security *(Oxford: Oxford University Press, 2012).*

Existing estimates of Russia's non-strategic nuclear capability, however, rely on a number of potentially problematic methodologies and definitions. First, by relying significantly on the piecemeal adjustment of previous estimates, old uncertainties can be compounded by new ones. For instance, the total non-strategic stockpile figure of 3,700–5,400 warheads given by 'World Nuclear Forces' in 2011 is produced by adjusting earlier estimates from the 1990s in accordance with official Russian statements regarding the proportional 75 per cent reduction of their non-strategic arsenals.[3] However, at least four estimates of Russia's stockpile from the early 1990s – which

suffer from an equal, if not larger, lack of transparency – have conclusions that vary by up to 10,000 warheads.[4]

Secondly, discrimination between operationally assigned warheads and reserve warheads awaiting dismantlement, and the subsequent association of assigned warheads with various delivery vehicles, is hampered by a lack of detailed analysis regarding the capabilities, tasking and distribution of these delivery vehicles. As non-strategic nuclear delivery vehicles are typically dual-use – even if their existence, number and distribution are actually confirmed – the manner in which they are assigned non-strategic nuclear warheads, if at all, remains uncertain. It is understandable, then, that Hans M Kristensen is quick to admit that when defining the size and distribution of Russia's operationally assigned non-strategic warheads, 'uncertainty and rumours fuel a debate full of half-truths, exaggerations and worst-case assumptions'.[5]

While existing estimates make assumptions about how non-strategic nuclear warheads are assigned to various platforms, it is not always clear how these assignment rules are produced. Neither is it clear how these rules inform the estimation of the number of warheads ultimately assigned to any particular system.[6] Alternatively, when those updating established estimates have been unable to discern such assignment rules, they sometimes resort to adjusting earlier estimates in line with official Russian statements and the suspected removal or retirement of unstated quantities of relevant delivery vehicles.[7] As discussed above, such an approach can compound uncertainties in earlier estimates. Importantly, when a lack of information prevents either approach from producing a clear figure for the number of assigned warheads, insufficient explanation is given for the approximate figure eventually postulated to prevent it from seeming arbitrary.

By producing a new estimate based on a new methodology, this study divorces itself from past estimates, and builds a clear estimate of Russian non-strategic nuclear forces from the ground up.

Notes and References

1. Hans M Kristensen and Robert S Norris, 'Nonstrategic Nuclear Weapons, 2012', *Bulletin of the Atomic Scientists* (No. 68, Vol. 5, September/October 2012); Shannon N Kile et al., 'World Nuclear Forces', in *SIPRI Yearbook 2012: Armaments, Disarmaments and International Security* (Oxford: Oxford University Press, 2012).

2. Madelyn Creedon and Andrew Weber, 'Fiscal Year 2013 National Defense Authorization Budget Request for Department of Defense Nuclear Forces Programs', joint statement before the Strategic Forces Subcommittee, Senate Armed Forces Committee, 28 March 2012, <http://www.armed-services.senate.gov/statemnt/2012/03%20March/Creedon-Weber%2003-28-12.pdf>, accessed 24 October 2012.

3. Shannon N Kile et al., 'World Nuclear Forces', in *SIPRI Yearbook 2011: Armaments, Disarmament and International Security* (Oxford: Oxford University Press, 2011), p. 334.

4. Amy F Woolf, 'Nonstrategic Nuclear Weapons,' CRS Report to Congress, May 2012, p. 20.

5. Hans M Kristensen, 'Non-Strategic Nuclear Weapons', Special Report No. 3, Federation of American Scientists, May 2012, p. 8, <http://www.fas.org/_docs/Non_Strategic_Nuclear_Weapons.pdf>, accessed 24 October 2012.

6. For example, the authors of 'World Nuclear Forces' postulate a 'nominal' load of warheads for a number of nuclear-capable systems, without discussing the formulation of this 'nominal' load. Often when nominal loads are attributed to systems, the given total does not reflect this nominal load. See: Naval Aircraft in Kile et al., 'World Nuclear Forces' (2011), p. 330, and 'Army Weapons' in Kile et al., 'World Nuclear Forces' (2012), p. 316.

7. For instance, in estimating the number of warheads assigned to Russian air-defence systems, 'Nuclear Notebooks' reduces earlier air-defence estimates by 60 per cent in accordance with official statements to produce a 2012 estimate of between 1,100 and 1,200 warheads. This estimate is then reduced to 300–400 warheads due to the retirement of old systems. See Kristensen and Norris, 'Nonstrategic Nuclear Weapons, 2012'.

II. The Foundations of a New Estimate

A NEW estimate of Russia's non-strategic nuclear potential must be built on a solid understanding of fundamental aspects of Russia's non-strategic force structures and planning systems. These include a number of important policy traditions, described below, that determine which systems are given a nuclear role, and how non-strategic nuclear warheads are assigned and distributed among these systems.

Russia's Non-Strategic Nuclear Force Structures

Storage

Standard Russian practices dictate that non-strategic nuclear warheads, unlike their strategic counterparts, are never installed onto their delivery platforms during peacetime. Instead, warheads are stored in national storage depots or in geographically dispersed regional supply centres (see Appendix 3),[1] and these warheads can only be distributed from there to available delivery vehicles under a direct order from the General Staff. These rules are adhered to so tightly that even Russian strategic bombers never actually fly with nuclear weapons; rather, they carry training dummies or practice weapons instead.

Before Russia offered to relocate all of its non-strategic nuclear warheads to storage under the Presidential Nuclear Initiatives (PNI) of 1991–92, there were important exceptions to this rule. Non-strategic nuclear warheads assigned to any force required to remain on permanent combat readiness, such as air-defence and ballistic missile defence forces, were deployed to, or stored alongside, these forces. Similarly, high-alert naval vessels on combat patrol carried nuclear-tipped weapons, as these ships could not be simply and swiftly resupplied with nuclear weapons if needed at short notice. In these cases, stringent segregation rules still applied. Non-strategic nuclear weapons assigned to air-defence units were stored in separately controlled technical sub-units, and could only be issued to firing sub-units under a direct order from the General Staff. Nuclear weapons aboard naval vessels could not be stored in any location that was routinely accessible by crew members,[2] and nuclear weapons could not be mated to ballistic-missile-defence systems unless the system was completely inaccessible to unauthorised persons.

Chain of Custody

To supplement this segregated storage system, the custody of these weapons (both inside and outside of long-term storage) is assigned to an entirely separate branch of personnel to those who could eventually use them. The crews of Russian (and Soviet) nuclear-weapon delivery platforms never touch the warheads assigned to them, and very rarely even see them. This chain of custody is dominated entirely by the 12th Main Directorate of the

Russian Ministry of Defence (otherwise known as the 12th GUMO), which is directly subordinate to the General Staff.[3] These personnel maintain control of non-strategic warheads from their creation to their loading onto delivery platforms.[4]

Russia's NSNW Assignment Standards

Unitary Assignment
The number of warheads operationally assigned for combat use is determined by the principle of unitary assignment. Non-strategic nuclear weapons are assigned to fundamental military units (such as air-defence battalions, air-force regiments, naval vessels or short-range-missile brigades, depending on platform type), in quantities designed to fulfil defined combat tasks.[5] They are not assigned to, neither are their numbers uniquely dictated by, individual delivery platforms. The standard by which warheads are assigned to these units is determined by the tasks each unit is configured to carry out. For nuclear-capable units, delivering nuclear warheads is essentially a 'task' to be carried out, and assigning such units with more nuclear 'tasks' than they were designed to fulfil would be either dangerous or an inefficient waste of limited resources. While a unit could be given fewer tasks than it would be conceivably capable of, its maximum 'assignable' capability would remain.

Standardised Assignment
Given this system of unit-based assignment, all units of the same type are assigned the same number of nuclear 'tasks', or warheads. This standard was established by the Soviet Union's early Tu-4 Bull bomber regiments (the very first nuclear unit within the Soviet armed forces). Although nearly all of these regiments contained varying numbers of aircraft, they were assigned the same number of nuclear warheads, and this standard persists to this day.

While actual combat capabilities may be affected by the loss of individual platforms within a unit, the number of platforms within a unit is not the concern of high-level military planners; rather, it is the responsibility of subordinate executors, who must fulfil the tasks set by military planners with however many delivery vehicles are at their disposal. Nevertheless, these executors can report to the General Staff if the lack of delivery platforms is so significant that they are unable to carry out orders (for instance, due to combat attrition), and military planners may choose to reinforce that unit or to transfer the order to a different unit; or they may even ignore these reports. Either way, military planners consider military units, not individual platforms, as the 'building blocks' of their strategy, and as such they assign non-strategic warheads to units in numbers determined by a specific task. As such, the total stockpile of operationally assigned warheads will be determined by military planners on the basis of the number of units available

and the tasks assigned to these units, not on the basis of a nominal loading of individual delivery vehicles.

Inflexible Assignment

While specific warheads are not physically set aside for specific units, this assignment is manifested as a standing order within the 12th Main Directorate to issue a certain number of non-strategic warheads of a certain type to a certain nuclear-certified unit, as soon as instructed. No matter how many warheads are unassigned and waiting in reserve, these assignment rules cannot be swiftly increased at the outbreak of war. Units within Russia's armed forces are designed to fulfil only a certain number of tasks, and without major restructuring cannot simply 'absorb' more warheads than they were originally meant to deliver. In this sense, these weapons are indeed truly assigned for use, and the number of operationally assigned warheads accurately reflects the number that could reasonably be used.

Russia's Stockpile of Non-Strategic Nuclear Weapons

Russia's non-strategic nuclear stockpile is not a homogenous entity. Warheads are kept in a variety of conditions and for a variety of purposes. For instance, Russian warheads are typically kept at one of four official states of readiness.[6] The first, and highest, state of readiness describes warheads that are kept combat-ready, with their degradable tritium yield-boosters and neutron generators installed. The fourth, and lowest, state of readiness describes warheads that require significant notice before they can be made combat-ready, and have significant aspects of their firing mechanisms removed. As the state of readiness of any warhead decreases, so does the immediacy of the threat it can pose. As such, any estimate of Russia's non-strategic stockpile should carefully discriminate between warheads kept at the highest state of readiness, and which therefore pose an immediate threat, and those kept at a low state of readiness, which do not.

Operationally Assigned Warheads

Depending upon Russia's perceived non-strategic nuclear requirements, as determined by Russian threat perceptions, nuclear doctrine and military structures, a carefully controlled number of 'operationally assigned' warheads are kept in the highest state of readiness. These warheads would be distributed to active delivery systems in pre-determined numbers should the order be given by the General Staff to prepare for a nuclear strike. The number of operationally assigned non-strategic nuclear warheads therefore represents Russia's most immediate and accessible non-strategic nuclear threat.

Warheads Assigned to Temporarily Unavailable Platforms

Warheads that are assigned to forces that are currently unavailable, such as those undergoing repair or maintenance, are temporarily placed in

the reserve stockpile of warheads and their status reduced from combat-readiness. This quantity of warheads cannot simply be assigned to other delivery systems that are not undergoing repair or maintenance in addition to their normal assignment. Instead, this quantity is only returned to combat-readiness when the systems they are assigned to return to operational status.

Russia's Strategic Reserve
Russia also maintains a reserve of non-strategic nuclear warheads. This strategic reserve of warheads is held in the possible – though highly unlikely – event that any delivery vehicles that survive an extended period of nuclear conflict (during which all operationally assigned warheads are exhausted) can receive and deliver a second round of assigned warheads. These strategic reserves are held in the third state of readiness, with their degradable tritium yield-boosters and neutron generators removed, and can only be made available for operational use with significant notice.

Spares
A small number of spare warheads are associated with operationally assigned warheads; warheads assigned to temporarily-unavailable platforms; and strategic reserve warheads, which act as replacements in the event that any warhead is found to be faulty. These spares are held at a similar level of readiness as their associated category. For instance, spares for operationally assigned warheads are held at the second-highest level of readiness to allow for replacement at the last minute. It is important to note that spare warheads are never distributed *in addition* to their counterparts in these categories, and therefore they do not add to the immediate potency of Russia's non-strategic nuclear forces.

Warheads Undergoing Refurbishment
At any given time Russia's non-strategic nuclear stockpile will contain a number of warheads undergoing refurbishment. These are transferred out of military custody into Russia's nuclear-weapon complex, and are kept in the fourth and lowest state of readiness and are unavailable for use.

Warheads Surplus to Requirements
Any warheads considered surplus to the above requirements are transferred to Russia's nuclear-weapon complex, outside of the military's jurisdiction, and are held in an extremely low level of readiness. These are not considered even as 'reserve' warheads, as they are not available for use in anything but the most extreme circumstances.[7]

A New Methodology
From these foundational assumptions relating to Russia's assignment and maintenance of non-strategic nuclear warheads, it is possible to develop a methodology for estimating, within a reasonable margin of error, not only

the number of Russia's operationally assigned warheads but also of its operational back-up, reserve and refurbishment warheads. To determine Russia's stockpile of operationally assigned warheads, this study first establishes which systems within Russia's armed forces are capable of delivering non-strategic nuclear warheads, and then discusses which systems actually utilise this capability. For each of these systems, this study then estimates unit-based warhead assignment rules. These are produced by drawing upon open-source information relating to historical warhead-assignment standards, changes in Russian military capabilities and systems, Russian threat perceptions and projected battlefield environments, and current procurement and research activities. With knowledge of the number of related nuclear-capable units,[8] these assignment rules can be applied to estimate the total number of non-strategic nuclear warheads operationally assigned to each particular system.

As mentioned above, although Russia maintains a strategic reserve of NSNW, it is unlikely any 'second-round' assignment could ever be implemented. The times of Hiroshima and Nagasaki have gone; never again will a lone aircraft be able to drop a nuclear bomb and destroy an entire city. Any contemporary nuclear strike would involve extensive and co-ordinated combat support operations (for example, NATO's SNOWCAT operations for air-delivered nuclear strikes).[9]

As any hypothetical nuclear exchange developed, therefore, combat attrition would quickly disrupt such carefully choreographed operations and even undamaged forces within a single unit would be by themselves incapable of carrying out the variety of roles that further strikes require. While surviving forces could be cobbled into one or two units to undertake further strikes, dramatically regenerating forces within such an environment would be almost impossible. As such, just as Russia could not assign more nuclear warheads than existing forces could conceivably deliver in one round, neither could it dramatically produce more delivery vehicles at the outbreak of nuclear war.

Nevertheless, it is still possible to extend this methodology to estimate the size of Russia's *overall* stockpile of non-strategic nuclear warheads (see Chapter VII). The size of this wider stockpile, which includes warheads assigned to temporarily unavailable platforms, spare warheads, strategic reserve warheads and warheads undergoing refurbishment, can also be estimated from open sources. Freely available information, drawn upon in this study, suggests that there may be universally held standards by which spare and reserve warheads are set aside, and that a predictable proportion of Russia's wider stockpile will be undergoing refurbishment at any given time.

Finally, this methodology can accommodate both new and old information relating to Russia's military forces. As the former emerges, the assignment rules, and the units to which they are applied, can be adjusted in line with the latest changes in Russia's military forces. With access to the latter, Appendix 2 applies this methodology retrospectively in order to test the estimates produced against official statements regarding Russia's overall non-strategic nuclear stockpile.

Note and References

1. Both regional and national warhead storage facilities are geographically separated from combat units. Only two regional stores (Olenegorsk-2 and Vologda-20, both in northwestern Russia) are within 50 km of any non-strategic nuclear weapon-certified unit.

2. It is thought that Russian surface ships do not operate nuclear torpedoes, because the torpedo tubes are located within accessible areas.

3. Before they were disbanded, each armed service branch had its own '6th Directorate', which would receive nuclear warheads from the 12th Main Directorate and distribute them to forces.

4. This was carried out in such secrecy that Soviet bomber crews, for instance, never knew if real or dummy nuclear cruise missiles were loaded onto their aircraft for training purposes. Within the national air-defence arm, the secrecy surrounding this information was so important that even dummy nuclear-tipped missiles contained a small radioactive capsule to imitate the radiation signature of a nuclear warhead.

5. Even a hypothetical order to fire a single ICBM (intercontinental ballistic missile) or SLBM (submarine-launched ballistic missile) would be issued to a military unit. This order would represent only a coded signal, translated by the unit's automated control systems, which would then initiate a launch sequence for a weapon of the desired type. The firing order itself does not in any way specify which particular weapon is actually to be launched.

6. In Russian, these are СГ-1, СГ-2, СГ-3 and СГ-4.

7. Many warheads awaiting dismantlement may not be compatible with existing delivery vehicles, as they are only compatible with vehicles which have since been phased out.

8. This information regarding the present composition of Russia's armed forces is based upon a wider ongoing study into Russia's armed forces currently being carried out at the Royal United Services Institute.

9. Support of Nuclear Operations With Conventional Air Tactics. SNOWCAT missions support nuclear strikes through a variety of non-nuclear operations such as mid-air refuelling, search-and-rescue operations or suppression of enemy air defences.

III. Ballistic-Missile and Air-Defence Systems

SINCE 1972, the Soviet Union, and subsequently Russia, has deployed ballistic-missile defence (BMD) systems around Moscow. The first, known as the A-35 system, achieved initial operational capability in 1972 and utilised Galosh interceptor missiles to provide a capability for engaging and destroying incoming ballistic missiles outside the Earth's atmosphere (exoatmospheric capability). The deployment of BMD systems, in terms of both quantity and location, were restricted by the US-Soviet Treaty on the Limitation of Anti-Ballistic Missile Defence Systems (the ABM Treaty), to no more than 100 interceptors at one permitted site.

By the 1980s, the Soviet Union had substituted the modernised A-35M with the A-135 system, which filled its quota of 100 interceptors with a combination of thirty-two exoatmospheric Gorgon interceptors and sixty-eight Gazelle interceptors (which operated within the Earth's atmosphere, or were endoatmospheric). The Gorgon interceptors were retired in 2006 without replacement, leaving the operational Moscow BMD system with only the shorter-range endoatmospheric Gazelle interceptors.

Table 4: The A-135BMD system deployed at sites around Moscow.

System	Delivery vehicle	Number of deployed delivery vehicles	Operationally assigned warheads
A-135	Gazelle interceptors	68	68

As the accuracy of both the A-35/A-35M and A-135 interceptors were insufficient to guarantee the successful interception of a complex incoming ballistic target, both systems utilised nuclear-tipped, rather than conventional, interceptors to destroy incoming missiles. The low-yield nuclear warheads currently employed by Gazelle interceptors are designed to detonate between altitudes of 5 to 30 kilometres above the defended area. This system is currently manned by the Russian Aerospace Defence Forces' 9th Ballistic Missile Defence Division.

As this is not the safest solution for defending the Russian capital, State Contract 406/1591 of 31 January 1991 ordered the design and testing of an improved version of the existing A-135 system under the Samolet-M research programme.[1] This contracted design study, still ongoing, requires a significant increase in interceptor accuracy to remove the need for nuclear interceptors and shift the system to fully non-nuclear interceptors. As such, if the new A-235 BMD system becomes operational in approximately 2015 as intended, the Moscow BMD system will become fully non-nuclear. Flight testing of newly re-designed, non-nuclear, short-range interceptors (known as 45T6 and 53T6M interceptors, both based on the Gazelle) has been under way since at least 1997 under this programme. In addition, a new, non-nuclear,

long-range interceptor (known as the 77N6) is also under development to replace the retired long-range Gorgon interceptor, and flight testing has been underway since 2007. As the Samolet-M programme progresses, the silos that once housed the now-retired, nuclear-tipped Gorgon interceptors would contain these modernised, non-nuclear 77N6 interceptors.[2] Similarly, the retirement of the existing nuclear-capable Gazelle interceptors, to be replaced by the 45T6, 53T6M, or 77N6, could, in principle, begin in approximately three years' time.

Once the Samolet-M research programme is complete, no nuclear warheads will be assigned to Russia's BMD system. However, this has not yet happened. Until the now-empty Gorgon silos are filled and the existing nuclear warheads for the Gazelle interceptors are retired, therefore, it is prudent to estimate that sixty-eight non-strategic nuclear warheads are assigned to the sixty-eight interceptors of the Moscow A-135 BMD system.

Comparison with Previous Estimates

The estimate that the A-135 BMD system defending Moscow is allocated sixty-eight non-strategic nuclear weapons is supported by those provided by SIPRI in its 'World Nuclear Forces' report and by the *Bulletin of the Atomic Scientists*' 'Nuclear Notebook'.[3] It has been suggested that the Gazelle interceptors currently deployed around Moscow as part of the A-135 system are not armed with NSNW, but there are a number of reasons to question this.

First, the accuracy of the existing Gazelle interceptors has not suddenly improved to the extent that nuclear interception is no longer necessary. Secondly, there is no reason to assume that Russia has completed the Samolet-M research programme ahead of schedule, and has replaced nuclear Gazelle interceptors with next-generation, non-nuclear 45T6 and 53T6M Gazelle variants, or the 77N6, several years before the scheduled completion date. Russia has a long record of failing to deploy weapon systems simpler than the Samolet-M programme to schedules that began at a similar time. For instance, since 1991 Russia has failed to complete development programmes to official deadlines in the cases of the Iskander and Bulava missiles, the Su-35 fighter, the S-400 and S-500 air-defence systems, and many others. It is highly unlikely that the Samolet-M research programme will be the first exception to this observable trend.

Air Defence

Russia's air-defence forces are distributed to varying extents between four different operators: the air force, the navy, the aerospace defence forces (a separate branch of the armed forces, directly subordinate to the General Staff), and, to a limited extent, the ground forces. Aside from the Navy, which primarily uses naval-variants of ground-based systems (discussed in

the Chapter V), these operators mainly use four different SAM systems: the SA-10/20 (members of the diverse S-300P family of SAM systems); SA-21; SA-12;[4] and SA-11.[5]

Table 5: Air-defence Systems.

System	Launchers deployed	Firing battalions deployed	Warheads assigned per battalion	Total assigned warheads
SA-10/20	696	87	0 or 1	0–87
SA-21	68	11	0 or 1	0–11
TOTAL				**0–98**

Where they are used, SA-10/20 and SA-21 battalions consist of actual SAM launchers, alongside their fire-control radar. As such, unlike the self-sufficient SA-11 and SA-12 SAM launchers used primarily by ground forces, these SAM launchers cannot operate outside the battalion structure. Typically, two to five SA-10/20 or SA-21 battalions form one SAM regiment, and one SAM brigade contains, at most, five such regiments. Two to five SA-11 or SA-12 battalions form one brigade. In both cases, SAM battalions form the fundamental unitary 'building blocks' of these forces.

According to ongoing RUSI analysis, Russia's air-defence forces currently include the following: five SA-11 battalions, ten SA-12 battalions, eighty-six SA-10/20 battalions, and eleven SA-21 battalions within Russia's Military Air Force, Aerospace Defence Forces and navy. In addition to these, are a further twenty-nine SA-11 battalions, nine SA-12 battalions, and one SA-10 battalion within the Russian Ground Forces. Regardless of their subordination, all nuclear-assigned battalions operate and are supplied according to the same standards.

Nuclear Capabilities

Within these air-defence forces, only some of the SAM systems are thought to maintain a nuclear capability. Other air-defence systems, such as Russian air-to-air missiles, have never been nuclear-certified (unlike the US, which once operated a nuclear air-to-air missile).[6] Determining which of the four SAM systems (the SA-11, SA-12, SA-10/20 and SA-21) are assigned non-strategic nuclear warheads is particularly challenging, as there is very little concrete information available on this topic.

Possible Operating Environments as an Indicator

In this situation, it is worth considering the potential environments in which these systems might operate. While the old inaccurate SA-1 air-defence system stationed around Moscow utilised nuclear warheads to enable it to defend against a massive air raid of up to 3,360 targets without resupply,[7] such a target-rich environment is almost unimaginable now. Indeed, delivering

the destruction of three Dresden-sized raids upon Moscow unfortunately no longer needs over 3,000 planes.

While Russian analysts express concern over a possible massive cruise-missile strike,[8] such a strike would fly so low and approach with so little warning that a nuclear intercept would lead to unacceptable collateral damage. Considerations such as these led to procedural and technical restrictions which deny the use of any nuclear-tipped SAMs against large target formations flying below a certain altitude, or against single targets. In the case of the SA-1 system, such restrictions therefore made the use of nuclear warheads against any target below an altitude of 2 km impossible.[9] Given that such hard-wired restrictions likely persist to this day, and that Russian military planners are unlikely to seriously consider a low-probability mass-strike of cruise missiles *above* 2 km, it is reasonable to suspect that Russia might not currently assign nuclear warheads to its SAM regiments.

System Design as an Indicator

The design philosophy of these systems also fuels doubts regarding the nuclear status of Russia's SAM regiments. According to Pyotr Grushin, chief designer for the majority of Russia's SAMs since the early 1970s, all missiles have been designed to operate like '[small-arms] cartridges', meaning that, once produced, SAMs are hermetically sealed into their storage or launch containers for the entirety of their (currently) ten-year service life.[10] After production, these sealed missiles should not need to undergo any additional checks or servicing that would require the breaking of this hermetic seal. If SAMs were nuclear-tipped, such design features would rule out necessary regular warhead checks and servicing. To enable the required servicings by making obvious changes to this designer-established practice for selected nuclear-tipped SAMs could lead to serious complications within the SAM supply chain.

Therefore, if one considers the likely operating environment for SAM regiments deployed with mobile ground forces assigned to defend the battlefield and adjacent areas, such as the SA-11 and SA-12 systems, in combination with this design philosophy, it seems unlikely that these systems would be nuclear-armed. It is hard to imagine that large formations of aircraft flying at high altitude would be used to attack units such as tank divisions, which are the units typically defended by these ground troop air-defence systems. Also, given the rapid response and flexibility required of battlefield air-defence systems, nuclear warheads would have to be pre-allocated to these forces, as operationally assigned warheads could never be delivered in time. This would break a fundamental security requirement: that no general-purpose field troops should possess nuclear weapons for any extended period of time.[11] Indeed, there is no available information suggesting that *any* air-defence systems assigned to Soviet or Russian ground forces maintained

a nuclear capability. Although the aerospace defence forces and the air force also operate a number of SA-11/12 systems, these were transferred from the ground forces to supplement a lack of SA-20 systems. As such, these transferred systems maintain the same design as their ground-force brothers, and all SA-11 and SA-12 systems are here considered to be non-nuclear.

There is, however, information that suggests the SA-10/20 systems were at least *designed* to be nuclear-capable. According to the chief designer at the VNIIEF (Arzamas-16) nuclear laboratory, Anatoliy Veselovskiy, the TA26 non-strategic nuclear warhead was designed and accepted into service in 1981 for use with the S-300 family of SAM systems (which includes the SA-10/20, and the naval SA-N-6 discussed in Chapter V).[12] It is not clear exactly which members of the S-300 family actually employ this warhead. However, a variant of the 5V55 missile family (used primarily by the SA-10 system but also compatible with the SA-20 and SA-21 systems), known as the 5V55S, probably utilises this warhead.[13] The addition of an 'S' to any missile designation traditionally refers to a 'special' (read: nuclear) missile. However, it is not entirely clear which systems actually use the 5V55S, or if there are other 'special' SAMs in operation.

There are certain uplink radio-command guidance systems within SA-10 control centres that suggest this particular system has at least the capacity to use nuclear-tipped SAMs. These command and guidance systems are very similar to those adopted by older SAM systems that are known to have been nuclear-equipped, such as the SA-1, SA-2 and SA-5 systems. However, a former Soviet source within Ukraine points out that the 5V55S was only used on old, partially mobile versions of the SA-10, indirectly suggesting that more modern, mobile variants of the SA-10 were not nuclear-equipped.[14] If this is the case, this would limit the employment of the 5V55S missile to the oldest versions of the SA-10 system, which are no longer in active service.

It is possible, therefore, that the SA-10 system was designed to be nuclear-capable, but this capability was not utilised outside of the oldest variants of the system. This is supported by reports that during the last decade Russian forces have not been training to prepare a nuclear strike using the SA-10 or SA-20 systems.[15] As this would strongly contradict a traditional Russian practice of obligatory nuclear-weapon-handling training for personnel within nuclear-certified units, it suggests that over the last decade, these systems have not been certified as nuclear.

Battalion Formation as an Indicator

This suspicion is compounded by the fact that important technical battalions were eliminated from the structure of all SA-20 and SA-21 air-defence missile regiments in the mid-1980s. These battalions were previously responsible for receiving missiles (and potentially their nuclear warheads), performing

checks and servicing, and ultimately issuing the (potentially nuclear-armed) missiles to firing battalions. Without comparable battalions within modern SAM regiments, there would be nobody to monitor any nuclear warheads between issuance and return by centralised warhead structures.

These arguments, however, do not rule out the *assignment* of non-strategic nuclear warheads to SA-10, SA-20 and SA-21 systems. It is possible that warheads are still assigned to these systems in anticipation of the potential return of mandatory training and support systems to these units. However, it is harder to resolve how a degradable warhead could be sustainably placed inside a hermetically-sealed container, which would never be serviced during its operational life. It is perfectly possible that Anatoliy Veselovskiy designed warheads for the entire S-300 family (including the SA-10/SA-20 systems) that have never been used.

As such, without any official information to confirm the nuclear status of the SA-10, SA-20 and SA-21 systems one way or another, it is prudent to be conservative and consider both possibilities within this estimate.

Assignment Standards

To develop assignment rules for these systems, it is useful to consider historical assignments of various Soviet-era SAM systems. First, it is thought that each regiment of the first Soviet SAM system, namely the SA-1, was assigned a total of six 5-kiloton warheads (originally the 901A15, then later the RA4 and TA11 warheads).[16] While this could be considered as equating to three warheads for each of the two batteries within one regiment,[17] in reality, only one firing platoon from one battery within a regiment was certified to use nuclear-tipped missiles.[18]

Second, Russian sources state that either two or three warheads (the 20-kiloton RA6 warhead, and later the RA52 warhead) were assigned to each battalion within an SA-2 regiment.[19] Nuclear-tipped missiles for each nuclear SA-2 battalion were stored centrally within its regiment, on transportation trailers. As there were always three nuclear-SAM trailers within this central storage facility, it is likely that each SA-2 battalion received three warheads rather than two. A similar storage practice was utilised among SA-5 regiments, which received only one nuclear warhead per battalion.[20]

The need for non-strategic nuclear warheads among the modern SA-10, SA-20 and SA-21 SAM systems has probably been reduced as the accuracy of these systems has improved. The accuracy of modern systems such as the SA-20 and SA-21 has possibly even increased to the point at which *any* nuclear assignment is no longer necessary. It is therefore reasonable to assume that if these three systems are indeed assigned non-strategic nuclear warheads, they would certainly not need more warheads than older,

less-accurate, systems. As with the SA-5 system, each of the SA-10, SA-20 and SA-21 SAM firing battalions are probably assigned no more than one non-strategic nuclear warhead. If this assignment rule is applied to the total number of SA-10, SA-20 and SA-21 battalions, this produces an estimate of no more than ninety-eight operationally assigned nuclear warheads in total.

Comparison with Existing Estimates
This estimate is significantly smaller than those given in the 'Nuclear Notebook' and 'World Nuclear Forces' series, which assume that between 300 and 400 non-strategic warheads are assigned to Russia's SAM systems.[21]

This discrepancy can be explained by the nuclear certification of certain systems, and in assumptions relating to how warheads are assigned to these systems. The difference between this estimate on the one hand and those within these two reports on the other is that the latter both consider the SA-12 to be nuclear-capable.

At the same time, both of these established estimates are seemingly based upon the assumption that approximately a third of available operational SA-10, SA-12, SA-20, and SA-21 systems carry nuclear warheads. That assumption could be derived from the fact that two warheads were assigned per nuclear-certified SA-2 battalion, which would suggest that the number of assigned warheads is equal to a third of the number of launchers in a battalion. As discussed above, historical precedents do not suggest such a standard was ever used. If warheads are assigned to the number of launchers, then historical evidence suggests one-tenth the number of SA-1 launchers, one-half the number of SA-2 launchers, or one-sixth the number of SA-5 launchers would be assigned, but never one-third.

Moreover, although it is known that the SA-10 and SA-20 systems were at least designed to be nuclear-capable, it is possible that Russia's SAM systems are no longer assigned a nuclear role. Technical battalions that would handle nuclear-tipped missiles have been eliminated, and compulsory training for nuclear-strike preparations seems to have stopped.

Finally, it is unclear how any warhead mounted on a hermetically sealed SAM could undergo necessary maintenance. As such, the final estimate given here is expressed as either zero, or ninety-eight.

Notes and References

1. 'A-235 System/RTTs-181M/Samolet-M R&D Programme' (in Russian), *Politburo* Independent Socio-Political Forum, 27 July 2011, <http://newsreaders.ru/showthread.php?t=2918>, accessed on 26 October 2012

2. *RIA Novosti*, 'Russia Revamps Missile Defenses around Moscow', 17 September 2012, <http://en.ria.ru/mlitary_news/20120917/176013705.html>, accessed 17 September 2012.

3. Hans M Kristensen and Robert S Norris, 'Nonstrategic Nuclear Weapons', *Bulletin of the Atomic Scientists* (Vol. 68, No. 96, 2012); Shannon N Kile et al, 'World Nuclear Forces', in *SIPRI Yearbook 2012* (Oxford: Oxford University Press, 2012) p. 316.

4. Previously SA-12 Zenith rocket brigades were deployed with ground forces only.

5. In addition to its naval-variant air defences, the navy uses two regiments of ground-based air defences (SA-20 and SA-21) to defend its bases in Kaliningrad and Kamchatka.

6. Thomas B Cochran, William M Arkin, Milton M Hoenig, 'US Nuclear Forces and Capabilities', in *Nuclear Weapons Databook* (Natural Resources Defence Council, 1984), p. 41.

7. The original structure of the 1st Independent Air Defence Army around Moscow, armed with the SA-1 system, was specifically designed to repel just such an air raid.

8. The chief of staff of Russia's aerospace defence forces, Major-General Andrey Demin, announced in June 2012 that the Aerospace Command supposes that around 1,000 cruise missiles could be used against Russian targets in the Moscow region in the case of large-scale hostilities. See: 'Military Have Calculated How Many Warheads One Needs to Penetrate Moscow's Missile Defence System' (in Russian), *newsru.com*, <http://www.newsru.com/russia/30jun2012/nebo.html>, accessed on 13 October 2012.

9. Given that the destruction radius of the warheads thought to be deployed on the SA-1 system was 1 km, this interception ceiling was relatively generous.

10. These missile containers are literally hermetically sealed: the last step of quality control is to submerge the container. If even the smallest air bubbles are detected, the container fails the quality-control stage.

11. The previous nuclear-capable SAM systems under the auspices of the National Air Defence Forces – the SA-1/2/5 – were fully (SA-1/5) or more-or-less (SA-2) fixed-site weapon systems, which did not *permanently* manoeuvre in the combat-duty area, so the supply of nuclear warheads to those units did not break the security requirements. This is not the case for modern SA-12 SAM units.

12. Anatoliy Veselovskiy, '65 Years of Glorious History: The Key to Stability and Development' (in Russian), *ProAtom*, <http://www.proatom.ru/modules.php?name=News&file=article&sid=2858>, accessed 22 October 2012.

13. The addition of an 'S' to the missile designation indicates a 'special', or nuclear, missile. See the historic website of the former 8th Independent Air Defence Army, which provided the air-defence cover for Ukrainian territory in the Soviet era, for more information: '8th Independent Air Defence Army Zenith-Rocket Troops' (in Russian), *8oapvo.su*, <http://www.8oapvo.su/zrv/55-hardware-zrv >, accessed 22 October 2012.

14. *Ibid*. This information is confirmed by some Russian sources, too; see Leonid Nikolaev, 'Secrets of "Triumph"', 25 April 2007, *Militaryparitet.com*, <http://www.militaryparitet.com/html/data/ic_news/14/ >, accessed 22 October 2012.

15. See, for instance, *airbase.ru*, 'Nuclear Warheads for SAMs' (in Russian), <http://forums.airbase.ru/2004/02/t24953--yabch-dlya-zur.html>, accessed 22 October 2012.

16. Author recollection.

17. One SA-1 regiment included just one firing battalion, which in turn consisted of two firing batteries of five firing platoons each. One SA-1 platoon consisted of six launchers – the same number as a single SA-2 *battalion*.

18. Author recollection. The 5th Platoon of the 1st Firing Battery in all SA-1 regiments was nuclear-certified.

19. See *airbase.ru*, Technical Battalion of S-75, S-200, S-300 Air Defence Missile Systems forum, p. 12, <http://forums.airbase.ru/2005/01/t31257,12--tekhnicheskij-divizion-zrk-s-200-s-125-s-75.html>, accessed 27 September 2012. The concurrent information points to the assignment of three nuclear warheads per SA-2 battalion; *Ibid.*, p. 8.

20. *Ibid*., p. 6.

21. 'Nuclear Notebooks' estimates 300–400: See Kristensen and Norris, 'Nonstrategic Nuclear Weapons'. 'World Nuclear Forces' estimates approximately 340: See Kile et al, 'World Nuclear Forces'.

IV. Air Force

THE Russian air force currently combines all of Russia's strike aircraft, including those transferred into the air force from disbanded naval aviation units.[1] While the air force also includes approximately half of the aerospace defence brigades (the other brigades located around Moscow are organised into the aerospace defence forces), all anti-ballistic and surface-to-air missiles are discussed in Chapter III.

In 2009, the organisational structure of the air force was changed in line with ongoing reforms to Russia's armed forces. Rather than categorising elements of the air force according to air regiments and air divisions, it now consists of a number of 'air bases'.

Each air base is comprised of a number of air groups, each of which is deployed at a different airfield. The majority of these air groups include aircraft of different types, with different combat purposes. A forthcoming RUSI study details these air force deployment patterns, and demonstrates that strike aircraft of the same type within one air group are on average deployed in groups of twenty-four aircraft.[2] There are reasons to believe that these units of twenty-four aircraft form a fundamental building block of the air force's structure, equivalent to air regiments prior to their restructuring into air groups.

After 1988, Soviet air regiments consisted of thirty-two aircraft grouped into three squadrons of ten or twelve aircraft. As it is still typical Russian military practice to divide units into three sub-units, it is possible that today's units of around twenty-four aircraft represent the equivalent of three slightly reduced 'squadrons' of eight aircraft. This would follow a visible diminishing trend in air-force structures; from roughly forty-four aircraft per regiment prior to 1988 to thirty-two aircraft after 1988, to twenty-four aircraft per 'regimental equivalent' now. A group of twenty-four aircraft is also roughly equivalent to a US squadron. For the purposes of estimating the number of non-strategic nuclear warheads assigned to the air force, the term 'regimental equivalent' will be used to describe a fundamental unit of the air force within one air group, comprising on average twenty-four aircraft of the same type and tasking.

Russia's Non-Strategic Nuclear Aircraft

Currently, there are four types of non-strategic nuclear-certified strike aircraft in the Russian air force: Tu-22M3 Backfires, MiG-25 Foxbats-D/F,[3] Su-24 Fencer-Ds and Su-34 Fullbacks.[4] Backfires, alongside strategic nuclear aircraft, comprise the air force long-range aviation branch. Fencers, Fullbacks and Foxbats, alongside the majority of other fighter aircraft, comprise the air force frontal aviation branch.[5] These are arranged into four regimental

equivalents of Backfires, ten regimental equivalents of Fencer-Ds,[6] one regimental equivalent of Fullbacks,[7] and one regimental equivalent of Foxbat-Ds and Foxbat-Fs (which is split between two air groups).

Although not all of these aircraft are immediately available, none has been officially excluded from the order of battle and the corresponding military units have not been downgraded or merged with other units (as was the case during recent rounds of air force reform).[8]

Table 6: Russia's Non-Strategic Nuclear Aircraft.

System	Delivery vehicle	No. of deployed systems	'Regimental equivalents'	Warhead assignment per regimental equivalent	Operationally assigned warheads
Backfire	AS-4 missiles	104	4	28	112
	AS-4 missiles (naval variants)		4	6	24
Fullback	AS-11, AS-13, and AS-18 missiles	17	1	18	18
	Nuclear bombs				
Fencer	AS-11, AS-13, and AS-18 missiles	219	9	18	162
	Nuclear bombs				
Foxbat	AS-11 missiles	15	1	18	18
	Temperature-resistant nuclear bombs				
TOTAL					334

Source: Author's calculations.

Air-Delivered Nuclear Weapons

In theory, all of the four types of non-strategic strike aircraft currently in operation are able to deliver both unguided nuclear bombs and guided nuclear missiles. The latter include the AS-4, AS-11, AS-13 and the AS-18, all of which come in both nuclear and non-nuclear variants, of which the latter is most common.

Frontal Aviation (Foxbats, Fencers and Fullbacks)

Foxbat-D/F reconnaissance-bomber/SEAD (suppression of enemy air defence) aircraft are wired for anti-radiation missiles (primarily the AS-11) or specialist temperature-resistant nuclear bombs designed to be delivered

at supersonic speeds; while both Fencers and Fullbacks are designed to be capable of delivering nuclear bombs or nuclear-armed guided missiles. At present, these missiles are thought to comprise of nuclear versions of AS-11 and AS-13/AS-18 air-to-surface missiles.

However, not all Fencers currently conform to their original nuclear-capable design. As part of the Russo-Ukrainian agreement regarding the stationing of Russian naval forces in the Ukrainian city of Sevastopol, a number of Fencers were deployed at Gvardeyskoye airfield north of the city in 2000. However, this agreement rests upon the precondition that these aircraft are *exclusively* non-nuclear. This non-nuclear status is verified twice a year through technical inspections detailed in paragraph six of the leasing agreement.[9] These inspections draw upon Ukraine's substantial experience of nuclear-capable Fencers when it was part of the Soviet Union in order to check that all nuclear-related avionics have been removed, and that seals to prevent their return are still in place. Since these Fencers were deployed, no violations of this condition have been announced.[10] Not only does this certainly rule out a nuclear capability for all Fencers associated with the Black Sea Fleet in Sevastopol, but it also calls into question the exclusively nuclear-capable status of *all* other Fencers.[11]

Although this particular unit of Fencers is not nuclear capable, and is therefore excluded from this study's estimate, it is unlikely that other entire units have been converted to become incapable of nuclear delivery. The air force is spread too thinly to create specialist units in the hope that they can be reconverted or relocated if circumstances change. Instead, it is possible that individual aircraft within a particular unit may be converted away from a nuclear capability. However, as warheads are assigned to units as a whole, this does not influence the methodology used for the estimate. It only requires the removal of one particular regimental equivalent from the final count.

Long-Range Bombers (Backfires)

There are good reasons to believe that the Backfire long-range bomber does not deliver nuclear bombs. When designing and employing the Backfire long-range bombers, Soviet military planners were well aware that the rapid development of surface-to-air missile defences around high-value targets would make any over-flying Backfire extremely vulnerable. As such, the employment of long-range aircraft was heavily influenced by the idea of stand-off attacks against high-value targets, using long-range guided missiles fired from a distance rather than bombs dropped from proximity.[12]

Hence, Backfire regiments mainly deliver five major modifications of the AS-4 missile (not all of which are nuclear-tipped). Until recently, Backfire regiments also used (exclusively) nuclear AS-16 missiles to cut a path through

air defences to enable further sorties with deeper strikes. Any target so poorly defended to allow overflight by a Backfire is most likely not worth attacking with a nuclear bomb, and so Backfires would only use nuclear bombs in the highly unlikely event that a high-value target is fortuitously ill-defended. As such, Backfires are probably designed to deliver only conventional bombs to low-value targets as a secondary mission. By contrast, frontal aircraft such as the Foxbat, Fencer and Fullback, which are more plentiful and better suited to tactical-scale engagements, are typically employed against targets that present a relatively low risk of intercept, such as armoured formations. As such, these aircraft maintain the option for delivering both nuclear bombs and nuclear missiles.

It is important to note that the AS-16 ground-attack missile, which was originally exclusively for nuclear purposes, has since the late 1980s been deployed to only three regiments of Backfires. Soviet-era AS-16 missiles reached the end of their service life in 2000, as they suffered from the same degradation in solid fuel that forced the withdrawal of the US AGM-69 short-range attack missile from service,[13] and were subsequently mainly used for training purposes. As far as it is known, attempts to produce a non-nuclear variant of the AS-16 to secure foreign buyers and keep production lines running according to contracts were made in the late 1990s, but were unsuccessful.[14] There is also no current data suggesting that AS-16 production has been resumed in Russia. Consequently, it is assumed that the only nuclear missile assigned to Backfires is the AS-4, and that no AS-16s are currently in service within the air force Backfire fleet. As such, it is also assumed that there are no operationally available non-strategic nuclear warheads stockpiled for AS-16 missiles.

Assignment Standards

Frontal Aviation

Information related to the manner in which the Soviet Union/Russia assigns nuclear weapons to frontal aviation units is sparse. However, a historical example from Soviet-era naval aviation can shed some light on assignment standards; as was traditional in Soviet planning, these standards were probably the same for sea- and land-based fighter-bombers. The Soviet *Kiev*-class aircraft carriers carried a complement of eighteen RN28 non-strategic nuclear strike bombs for their Yak-38 Forger fighter-bomber group,[15] in addition to their helicopter-delivered nuclear depth bombs, which were contained in a separate magazine (discussed in Chapter V). While the size of Soviet carrier air groups, which were ranked as shipborne air regiments, was limited to thirty-six aircraft, their structure was not fixed and could include varying numbers of Forger fighter-bombers.[16] However, the storage capacity of the carriers' nuclear bomb magazine was fixed at eighteen dedicated strike weapons. That means that the full carrier-based fighter-bomber regiment

had just eighteen weapons assigned to it for prolonged hostilities at most; furthermore, the Soviet navy's ability to resupply its carriers at sea was very limited. Bearing in mind that assignment of nuclear weapons is assumed to be done on a *unitary* (in this case regimental) basis, it did not matter that in some cases only part of a full regiment would be deployed aboard the carrier.

Another historical example of non-strategic nuclear-bomb assignments can be found in records relating to the Cuban Missile Crisis. According to these records, six 407N nuclear bombs were assigned, and deployed on Cuba, for use by one independent squadron of Il-28 Beagle frontal bombers.[17] Although only six Beagle bombers had been deployed on Cuba by the time the crisis was resolved, this squadron was meant to contain twelve aircraft. As an *independent* squadron, rather than a dependent sub-unit of a larger regiment, non-strategic nuclear warheads could be assigned to it specifically, rather than to an encompassing regiment. Recalling that standard Soviet structures assumed one regiment contained three squadrons, this would suggest that had a full regiment been deployed on Cuba, it would have been assigned three times the number of bombs assigned to the independent squadron: namely, eighteen nuclear bombs. Given the difficulties of regularly resupplying Soviet troops in Cuba via transport lanes near the US, these troops were meant to operate (but not fight) for a period of between two and three years without re-supply.[18] As with other relatively isolated deployments, the number of non-strategic nuclear weapons assigned to Soviet troops in Cuba was calculated along the normal wartime standards; it did not represent an inflated assignment. These two independent sources seem to suggest the same estimate: eighteen non-strategic nuclear weapons assigned to each frontal aviation regiment. In the absence of contradictory information, it is not unreasonable to extrapolate this standard to modern nuclear-certified frontal aviation units.

One could argue that because frontal aircraft can deliver both nuclear bombs and nuclear missiles, one should also assume that warheads for both delivery systems are assigned to aircraft simultaneously, doubling the assignment of warheads. However, there is little reason to believe that strikes carried out by either system would require dramatically different assignment standards. As such, the possible assignment of warheads to bombs, missiles or a mixture of both does not change the assumption that eighteen non-strategic nuclear weapons would be assigned in total. It is also important to remember that as the sophistication of conventional weaponry increased, the faith placed in massive use of non-strategic nuclear weapons by Soviet planners decreased. As such, even in the face of NATO's conventional military superiority, it is unlikely that the share of combat tasks carried out by nuclear weapons has increased since the Cold War. If anything, the share of combat tasks completed by nuclear weapons is likely to have decreased.

Until further information becomes available regarding the nuclear tasking of frontal-strike bombers, it is reasonable to extrapolate an assignment rule from the information available, which suggests that eighteen nuclear weapons, consisting of a mix of bombs and missiles, are assigned to one frontal-strike 'regimental equivalent'.

Long-Range Aviation (Land Strike)
Given the different combat purposes of long-range bombers and frontal-strike aircraft, it is likely that nuclear-weapon assignment rules will differ between the two. Unfortunately, the available information on the assignment rules for heavy bombers is even less complete than that for frontal-strike aircraft, and is restricted to published information on retired Soviet-era heavy bombers. This suggests that twenty-eight nuclear bombs were assigned to a single regiment of Tu-4 Bull long-range bombers in the late 1950s and early 1960s.[19] While assigning this many warheads to a single regiment of modern, sophisticated Backfire bombers may seem excessive, in the absence of any information to the contrary and given the similarity in the tasks assigned to both, it is not entirely unreasonable to apply the same assignment rules to Backfire bombers. As such, an assignment rule of twenty-eight nuclear weapons (as missiles, or possibly a mixture of missiles and bombs) for one 'regimental equivalent' of Backfires in land-attack mode is assumed.

Long-Range Aviation (Naval Strike)
All air force Backfire forces are also tasked to carry out naval strikes with the use of dedicated anti-ship versions of the AS-4 missile system. These variants, known as the Kh-22MA, Kh-22N and Kh-22NA, differ significantly from the ground-attack variants discussed above. These systems carry the lower-yield TK55 warhead and, as such, require a separate stockpile of Backfire-assigned warheads for naval-strike missions. This is not the case for Fencers and Fullbacks. While both can (or in the case of Fullbacks, *will*) carry out both ground- and naval-strike tasks, neither would be tasked to attack such high-value (and highly defended) naval targets to necessitate the use of nuclear weapons.

To estimate a non-strategic nuclear assignment rule for the Backfire's naval-strike missions, it is useful to draw upon a Soviet military study that argued that a salvo of missiles delivered by seven aircraft, from several directions, was required to overwhelm and penetrate the air defences of an aircraft-carrier battle group (CVBG, the naval threat).[20] When the electronic counter-measure (ECM) support aircraft (necessary for such a mission) are included, this equates to approximately one squadron, or eight Backfires, for an attack against a high-value naval target.[21]

Distributing missiles and warheads within a salvo is a very complicated tactical task, and will not be discussed in detail here. However, there are some

important considerations which affect the *number* of warheads assigned to a salvo. First, the key to penetrating the multi-channel air defences of a CVBG is the element of surprise. Once incoming missiles are detected, it would be possible to discern the general axis of assault, and any subsequent salvo of missiles would have little to no chance of success. As such, any stand-off Backfire strike on a CVBG, or even its lesser-defended brother, the Amphibious Readiness Group, is inevitably a hit-and-run affair.

Secondly, only one warhead, rather than a number of warheads, is assigned to a single salvo, as adding back-up warheads would be an unnecessarily complicated, expensive and wasteful use of limited warheads. If one warhead successfully strikes its target, the resultant shock wave and radiation would badly disrupt any other incoming missiles.

Although a salvo of missiles delivered by seven aircraft was thought to be sufficient to penetrate a CVBG's air defences, given its heavy air defences, one nuclear strike does not guarantee a carrier's complete destruction. Given the value of such a target and the difficulty in finding a mobile CVBG after an extended period of time, it would be prudent to provide munitions for further, prompt hit-and-run strikes along a new and unexpected axis of assaults if deemed necessary. Given the delay in receiving new warheads from central storage, warheads for such a prompt second-strike would probably be assigned along with those for the first. It is unlikely that a squadron of Backfires would survive more than two missions while maintaining sufficient capabilities for independent operations. As such, it is safe to assume that one squadron of Backfires would receive two warheads, to deliver within two separate strike missions on a CVBG.

Bearing in mind that Backfire regiments traditionally consist of three squadrons, altogether the assumptions above provide an estimate of six operationally available nuclear warheads for AS-4 ASMs assigned to each of the four Backfire regimental equivalents.

Comparison to Established Estimates

The non-strategic nuclear warheads assignment rules described above lead to a total estimate of 334 operational warheads assigned to fifteen air force regimental equivalents comprising 355 operational strike aircraft. This estimate differs significantly from those produced by the 'Nuclear Notebook' and 'World Nuclear Forces' series, which both estimate a total of 730 warheads. There are a number of clear differences between the assumptions adopted by these estimates and those described above that deserve mention.

First, both estimates consider a far higher number of Backfires, Fencers and Fullbacks to be operationally available for nuclear missions (430

compared to the 340 in this study). It is possible that both sources include a number of Fencers that commercially available satellite imagery confirms are actually located in a scrap yard awaiting dismantlement. Importantly, no discrimination is made in their overall count regarding nuclear-capable Fencers, converted non-nuclear Fencers and reconnaissance Fencer-Es, which are nuclear-incapable by design. Secondly, neither source considers the Foxbat to be nuclear-capable, while this study assumes that fifteen are. Thirdly, while 'Nuclear Notebooks' does not assume a 'nominal load' per aircraft, 'World Nuclear Forces' assumes that while only half the available aircraft maintain nuclear-strike missions, those that do are nominally loaded with two non-strategic nuclear warheads.[22] This study, by comparison, does not assume a nominal loading; rather, a nominal assignment of warheads to a particular unit. Fourthly, both 'Nuclear Notebooks' and 'World Nuclear Forces' make different assumptions regarding which nuclear-capable weapons can be deployed on which aircraft. The nuclear versions of the AS-11, AS-13 and AS-18 are not considered, while the AS-16 is, and both assume that the air force Backfire is assigned nuclear bombs. This difference in assumption, however, makes little difference to the overall weapon count.

Notes and References

1. The Russian navy currently possesses just one fighter regiment: the 279th Independent Shipborne Fighter Regiment for the aircraft carrier *Admiral Kuznetsov*. There are also several squadrons of anti-submarine fixed- and rotary-wing aircraft. None of these forces fall into the 'strike-aviation' category and nuclear-capable anti-submarine warfare aircraft are discussed in this article separately in Chapter V.

2. Igor Sutyagin, forthcoming.

3. More information about the MiG-25 Foxbat-D can be found at 'Mig-25RB' (in Russian), *Sky's Corner – Aviation Encycopaedia*, <http://www.airwar.ru/enc/spy/mig25rb.html>, accessed 30 October 2012. The Foxbat-F SEAD aircraft is equipped for the combat use of the AS-11 anti-radiation missile. Anatoliy Veselovskiy (former chief designer of nuclear warheads) mentions in his memoirs the existence of a nuclear warhead for the AS-11, whose Russian designation is the Kh-58. As such, this missile is believed to be nuclear-capable. Anatoliy Veselovskiy, '65 Years of Glorious History: The Key to Stability and Development' (in Russian), *PRO-Atom Agency*, 2 March 2011, <http://www.proatom.ru/modules.php?name=News&file=article&sid=2858>, accessed on 26 October 2012.

4. The nuclear capability of the Fullback (Su-34) frontal bomber has been openly stated since at least 2004. See Anatoli Diakov, Eugene Miasnikov, Timur Kadyshev, 'Non-Strategic Nuclear Weapons: Problems of Verification and Limitation', Center for Arms Control, Energy and Environmental Studies, 2004, p. 20; A Arbatov, 'Tactical Nuclear Weapons: Problems and Solutions' (in Russian), *Voenno-promyshlenniy kurier* [*Military-Industrial Courier*], 5–11 May 2010, <http://www.carnegie.ru/publications/?fa=40747&solr_

hilite>, accessed 30 October 2012; interview with General Aleksandr Zelin (in Russian), *Nezavisimoe voennnoe obozrenie* [*Independent Military Review*], 20 March 2012, <http://nvo.ng.ru/realty/2012-03-16/1_zelin.html>, accessed 30 October 2012 .

5. Air groups may contain a number of regimental equivalents from both aviation branches. Other aircraft and helicopter gunships are included in the Russian army's aviation branch, which provide close air support. Understandably, these close-air-support aircraft have no nuclear role.

6. It is important to distinguish between Fencer-D *bombers* and Fencer-E/F *reconnaissance and electronic countermeasures aircraft*. Rather than maintaining dedicated bomber avionics and installations, the latter two instead maintain specialist reconnaissance and electronic counter-measure equipment.

7. The Fullback aircraft only recently entered mass production, which explains why the first 'regimental equivalent' is not yet fully equipped.

8. There is information that suggests only forty Backfires are currently airworthy. No new NK-25 jet engines (used by Backfires) have been produced for sixteen years, and these engines stopped being repaired nine years ago. See Georgi Shibanov, 'Wingless Russia' (in Russian), *Pravda*, 26–29 August 2011, <http://gazeta-pravda.ru/content/view/8717/70> , accessed 23 October 2012; Vladimir Leonov, 'Jet Engines and "Dream Factories"' (in Russian), *Argumenty Nedely* , 11 January 2012, <http://argumenti.ru/print/society/n322/149113>, accessed 23 October 2012.

9. 'Protocol on the procedure to carry out the substitution of the Black Sea Fleet naval aviation's Su-17 combat aircraft with Su-24 aircraft', signed on 16 February 2000. Verification procedures are described in 'Methodology of verification of fulfilment of measures aimed to removal from Su-24 aircraft capability to employ nuclear weapons by this aircraft', appended t o the protocol. See: 'Russia Hides Nuclear Weapons in Crimea?' (in Russian), *ruport.info*, 19 July 2009, <http://www.rupor.info/glavnoe/2009/07/19/rossija-prjachet-v-krimu-jadernoe-oruzhie-kopija-d/>, accessed on 26 October 2012.

10. In July 2009, Russia refused to present four Fencer-E reconnaissance aircraft for Ukrainian inspection as these were never designed to be nuclear-capable. See 'Russian Black Sea Fleet has not let Ukraine to check its aircraft' (in Russian), *Re:public Бета*, 16 July 2009, <http://republic.com.ua/article/12494-old.html>, accessed 30 October 2012.

11. The same is most probably correct for the rest of the Russian non-strategic bomber forces. There is no reason to believe that Fencers are the only exception to a general rule. Indeed, such an exception would contradict the traditional standardisation of Russian forces. Estimating Russia's stockpile of assigned non-strategic nuclear warheads on the basis of the association of a certain number of warheads with the total number of aircraft does not take this issue, which is supported by a verified bilateral agreement,

into account. In order to do so, such a methodology would have to consider exactly how many aircraft have been converted to a non-nuclear role.

12. This rule of engagement became typical for all contemporary Soviet 'strategic', or long-range, bombers.

13. 'Air-to-Surface Missiles: Kh-15 Aeroballistic Aviation Missile' (in Russian), *Voennye pensii* [*Military Pensioners*], 04 March 2012, <http://rosvoenpens.ru/новости/ракеты-воздух-земля/>, accessed on 26 October 2012. The assignment of AS-16 missiles to the regiments of Tu-160 Blackjack strategic bombers planned for the period of 1991–94 never occurred. Rather, these aircraft were equipped with the AS-15 cruise missile. Only three AS-16 training mock-ups were delivered to the first heavy-bomber regiment to use the Blackjack.

14. It is possible that this non-nuclear variant of the AS-16 was developed primarily for the purposes of foreign export.

15. 'Kiev-class Heavy Aircraft-carrying Cruisers: Project 1143 Krechet', *Atrina: Soviet and Russian Warships (1945-2005),* <http://atrinaflot.narod.ru/2_mainclassships/01_takr_1143/0_1143_1.html>, accessed on 28 October 2012.

16. *Ibid.* Anti-submarine warfare helicopters were included as part of these carrier air groups, and their nuclear depth -bombs were stored in a separate magazine. Both are discussed in Chapter V.

17. The order of battle of the group of Soviet troops on Cuba, in 1962 during Operation *Anadyr*, can be found (in Russian) at <http://www.waronline.org/write/world-military/russian-military-abroad/cuba/>, accessed 30 October 2012.

18. *Ibid*.

19. K Chuprin, 'Bombs with Tender Names' (in Russian), *Nezavisimoe voennoe obozrenie*, 15 June 2005, <http://nvo.ng.ru/armament/2005-06-10/1_bombs.html >, accessed 30 October 2012.

20. V Markovskiy, 'Backfire: Breakthrough from Obscurity' (in Russian), *AeroHobby* (Vol. 1, No. 3, 1993).

21. Just two specialist Tu-22MP planes of the Backfire's ECM version have been built, so in previous years Backfires have relied upon the specialist Blinder-E ECM versions. It is apparent that upon the retirement of all Blinders, their ECM task will be fulfilled by ad-hoc ECM Backfires.

22. Shannon N Kile et al., 'World Nuclear Forces', *SIPRI Yearbook 2012* (Oxford: Oxford University Press, 2012), p. 330. This 'nominal loading' is also considered by Hans M

Kristensen, 'Non-Strategic Nuclear Weapons', Special Report No. 3, Federation of American Scientists, May 2012, <http://www.fas.org/_docs/Non_Strategic_Nuclear_Weapons.pdf>, accessed 30 October 2012.

V. The Navy

IN contrast to other elements of Russia's armed forces, individual ships are each considered to be a separate military unit in themselves.[1] Therefore this discussion focuses on the assignment of non-strategic nuclear warheads to individual ships, rather than their assignment to brigades or divisions of ships. Each vessel is categorised according to four ranks, established in the late eighteenth century. It was decided early in the Soviet navy's nuclear history that it was obligatory for first- and second-rank ships to operate nuclear weapons, while such operation was optional for third-rank ships and forbidden for fourth-rank ships.[2] These ranks contain a diverse array of platforms, some of which operate more than one nuclear-capable system, including submarine-launched cruise missiles (SLCMs), anti-ship missiles (ASMs), air-defence systems (ADS) and anti-submarine warfare (ASW) weapons.

Table 7: Russia's Naval Non-Strategic Nuclear Warheads.

	Warheads by weapon system				Total operationally
Platform	**SLCMs**	**ASMs**	**ADS**	**ASWs**	**assigned warheads**
Surface combatants		29	5	43	77
Submarines	96	15		76	187
Anti-sub aircraft				46	46
Coastal defences		20			20
TOTAL					**330**

Source: Author's calculations.

Some uncertainty remains as to whether non-strategic nuclear warheads are only assigned to, rather than actively deployed on, certain vessels within the Russian navy. During the Cold War, it was usual for non-strategic warheads to be physically deployed aboard any vessel on active combat patrol. However, as part of the 1991–92 Presidential Nuclear Initiatives, Russia declared it would relocate all such warheads to national or regional storage. For the vast majority of Russian naval vessels there is no reason to doubt Russia's 2005 declaration that this promise had been carried out.[3] However, a 2006 statement by then-Minister of Defence Sergei Ivanov suggested that all of Russia's submarines (both strategic and attack-class) carry nuclear warheads.[4] As attack-class submarines could only use non-strategic nuclear weapons, one cannot completely exclude the possibility that Russian attack submarines might still be deployed with such warheads aboard.

Assignment Standards

Soviet military planners took correlations between NATO and Soviet naval forces very seriously indeed. For instance, Soviet planners calculated that a *Kresta II*-class anti-submarine cruiser, and its successor, the *Kara*-class cruiser, operating in the Mediterranean would survive for only 34 minutes

on average upon the break-out of major conflict.[5] After that time, the cruiser would have either been destroyed or damaged beyond operational capability. It was expected that other major classes of Soviet naval surface combatants in similar threat environments would also suffer from such a short wartime lifespan. Given that the Soviet navy did not expect to fight nuclear battles for very long, it is highly unlikely that these surface combatants would have been equipped with more nuclear warheads than they could conceivably deliver in a short time.

Needless to say, the survivability of the Russian surface combatants at the outbreak of a nuclear conflict has not dramatically improved. As in Soviet-era military planning, it is here assumed that Russia would likely assign only the number of warheads that could be employed during a single surface vessel's combat lifetime. As submarines do not currently suffer from the same lifespan concerns, their assignment of non-strategic nuclear weapons is limited less by lifespan, but more by available space.

Anti-Submarine Warfare Weapon Systems

The Russian navy currently possesses five nuclear-capable ASW weapon systems: the SS-N-14, SS-N-15 and SS-N-16 missile systems,[6] the M-5 underwater anti-submarine rocket (with the 15-kiloton TV3 warhead) for the VA-111 Shkval ASW system, and finally the RYu2-2 nuclear depth bomb. Although nuclear torpedoes are primarily intended for use against formations of surface ships, they are considered in this study, for the purposes of editorial clarity, because some could theoretically be used in an ASW role. While the SS-N-14 anti-submarine missiles and nuclear depth-bombs are used by surface combatants, the SS-N-16, the Shkval rocket system and nuclear torpedoes are deployed only aboard submarines. The SS-N-15 can be used by both surface combatants and submarines.

While many nuclear torpedoes have been retired from service,[7] it is possible that the Russian navy maintains some nuclear-capable torpedoes such as the dual-purpose USET-80 torpedo.[8] Warheads using the standardised 'ASBZO' housing for all 533-mm torpedoes were still being designed in the early 1980s, and could still be assigned today. It was established in the early 1960s that surface ships are not armed with nuclear torpedoes, something which remains the case today; instead, this is the prerogative of submarines.

Submarine-based Anti-Submarine Weapons

While it is difficult to establish exactly what combination of ASW weapons are assigned to submarines (missiles, rockets or torpedoes), there are indications that it was standard practice between the mid-1960s and late 1980s for most submarines to be assigned two torpedo-tube-launched non-strategic nuclear warheads (excluding SLCMs, which are also launched from torpedo tubes, but were considered separately).[9] While it is possible that

nuclear weapons have come to play a reduced role in modern anti-submarine warfare, there is little information to suggest that this assignment practice has changed dramatically. The understandable desire to maintain some level of nuclear flexibility, when combined with traditional naval conservatism, suggests it is not unreasonable to assume that this standard assignment of two tube-launched non-strategic warheads (for use on anti-submarine missiles/rockets, or torpedoes) persists.

Table 8: NSNW Assigned to Anti-Submarine Systems.

Surface Ships	No.	SS-N-14	SS-N-15	Nuclear depth bombs	Total warheads
Kuznetsov CV	1			8	8
Mod. *Kirov* CGN	1		1	1	2
Slava CG	3			1	3
Sovremenniy DDG	2			1	2
Udaloy DDG	7	1		1	14
Udaloy II DDG	1		1	1	2
Mod. *Kashin* DDG	1			1	1
Kara CG	1	1		1	2
Krivak I/II FFG	3	1			3
Neustrashimiy FFG	2		1	1	4
Steregushchiy	2			1	2
Surface ship total	24	11	4	28	43
Submarines, all classes	38		2 torpedoes/missiles		76
ASW aircraft	46			1	46
TOTAL					**165**

Source: Author's calculations.

Surface-Based Anti-Submarine Weapons

Similar assumptions regarding tactical flexibility play a large part in estimating assignment rules for surface-based anti-submarine missiles. For instance, while the *Krivak*-class frigate only operates four SS-N-14 missiles, its ranking and lack of alternative means of delivery suggests that the SS-N-14 system is the only nuclear candidate. However, if more than one warhead is assigned to its complement of four missiles, the flexible use of this system will be seriously jeopardised.

Similarly, if one considers the predicted survival times of such ships in high-threat environments (as mentioned above), it is unlikely that surface combatants would be able to carry out more than one look-shoot-look nuclear anti-submarine strike within its expected lifespan.[10] Any additional ASW nuclear warheads aboard would be an unnecessary load limiting the ship's tactical flexibility by taking up limited space. This study therefore

assumes that just one nuclear-tipped anti-submarine missile of any type is assigned to each nuclear ASW-capable surface combatant.

Nuclear Depth Bombs

While both helicopter carriers and the helicopters operating from them can be classed as units to which warheads can be assigned, it is the ship that is considered to actually carry out ASW tasks. However, while nuclear depth-bombs are assigned to ships, the tasks the ships can complete (and therefore the number of depth bombs assigned to complete them) depend upon the number of helicopters they can conceivably carry.

To estimate assignment standards for nuclear depth bombs, it is useful to draw upon the fact that the nuclear depth-bomb magazine on board *Moskva*-class helicopter carriers had capacity for eight bombs.[11] These carriers were originally designed to carry eight helicopters,[12] suggesting that at most one nuclear depth-bomb were assigned to each helicopter. If this is still the case, as only one of three helicopters hosted by *Kirov*-class battlecruisers is assigned an ASW role, this standard suggests only one warhead would be assigned. While this standard would suggest that *Udaloy* and *Udaloy II* destroyers, which both host two helicopters, would be assigned two nuclear depth-bombs, this might seem generous given these destroyers are also equipped with nuclear-capable anti-submarine missiles. As such, it is not unreasonable to assume that both are assigned only one nuclear depth bomb, rather than two, for both helicopters. In addition to vessels that permanently host helicopters, there is information to suggest that vessels capable of only temporary support for helicopters also store nuclear depth bombs, just in case.[13] In cases such as these, it is highly unlikely that more than one nuclear depth bomb would currently be assigned to such ships.

Interestingly, the *Moskva*-class helicopter carrier case also provides some insight into the potential assignment of nuclear depth-bombs to *Kuznetsov*-class aircraft carriers. While the former was originally designed to house eight helicopters, this capacity was increased to fourteen. However, there is no information to suggest that the nuclear-depth-bomb magazine was similarly increased. This suggests that in the case of dedicated aircraft carriers, it was felt that one nuclear depth bomb for every helicopter was unnecessarily generous. Assuming this is the case today, the *Kuznetsov*-class carriers, which can also host fourteen helicopters, would also be assigned only eight nuclear depth-bombs.

There is very little information regarding nuclear-depth-bomb assignments to units of fixed-wing, anti-submarine aircraft. Rather, what little information is available suggests an assignment standard of one nuclear depth bomb as a typical combat load per single shore-based, fixed-wing ASW aircraft.[14] This assignment may seem generous, but shore-based patrol aircraft typically

operate in lower-threat environments and could therefore survive longer than other ASW platforms, to complete more than one mission.

The above assignment rules produce an estimate of 165 non-strategic nuclear warheads assigned to anti-submarine missions. The difference between this estimate and both of the existing estimates may be explained by a number of qualitative differences in the vessels considered and the weapons deployed on them. First, the assignment of typically one nuclear depth bomb per ship assumed here differs dramatically from Western practice, and it is possible these have simply been reflected in assumptions about Russian practice. Secondly, 'Nuclear Notebooks' considers the *Kirov*-class cruiser and *Neutrashimy*-class frigate to be armed with SS-N-16 ASW missiles. However, there is no version of the SS-N-16 for deployment on surface ships, and no surface ship is equipped with the 650-mm torpedo tubes necessary to launch these missiles. Similarly, 'Nuclear Notebooks' assigns nuclear depth-bombs to *Krivak I/II*-class frigates, despite these frigates having no helicopter capability. On the other hand, the 'Nuclear Notebooks' series does not consider *Udaloy II* and mod. *Kirov*-class ships, or the *Delta III* submarine, as employing the SS-N-15 system, despite these vessels being equipped to do so.

Land-Attack Submarine-Launched Cruise Missiles

In the Soviet and Russian navies, submarines were, and are, the only operators of long-range land-attack cruise missiles. The only land-attack SLCM operating in the Russian navy is the SS-N-21, which was accepted for service at the end of 1983. This SLCM is exclusively nuclear, being first armed with the TK66-02 warhead and later the TK66-05 warhead, and was first deployed aboard the modernised *Yankee Notch* strategic missile submarines.[15] Later, the quiet, nuclear-powered *Victor III*-, *Sierra II*- and *Akula*-class attack submarines were similarly equipped with these missiles. In 2012, only these three classes of submarine (of which there are ten *Akulas*, one *Sierra II*, and two *Victor III*s in active service) operate the SS-N-21. A further two *Akulas*, one *Sierra II* and two *Victor IIIs* are currently held in reserve or are under refurbishment.[16]

Table 9: Non-Strategic Nuclear Warheads Assigned to SLCMs.

Class	SLCMs per submarine	No. of submarines	Assigned warheads per class
Victor III	4	2	8
Sierra II	8	1	8
Akula	8	10	80
TOTAL			**96**

Source: Author's calculations.

As these missiles are exclusively nuclear, to understand how many warheads are assigned simply involves understanding how many missiles are assigned. It has been suggested by well-informed Russian sources that the third-generation submarines (*Sierra II* and *Akula* class) carried between two and eight SLCMs, depending on their mission.[17] As SLCMs are stored in the same limited space as torpedoes, one might suspect that carrying this many SLCMs would limit the tactical flexibility of these submarines. However, both the *Akula* and *Sierra II* submarines have a large storage capacity (twelve 650-mm weapons, alongside twenty-eight 533-mm weapons and thirty-six 533-mm weapons respectively), thereby reducing these concerns. On the other hand, the *Mike*-class submarine (of which the only example was lost at sea in 1989) had a lower storage capacity (twenty-two 533-mm weapons), and was intended to carry only four SS-N-21s.[18] The *Victor III* attack submarine has even less capacity (only six 650-mm and eighteen 533-mm weapons), and as such this study assumes that it is assigned only four SLCMs.

As discussed above, five SLCM-capable submarines are currently under repair or are held in reserve, and as such both the SLCMs and their associated warheads are similarly stored in reserve, and without available submarines to deliver them, are not considered as operationally assigned. In total, it is estimated that there are ninety-six warheads assigned to ninety-six operationally assigned SS-N-21 SLCMs. Importantly, while the 'Nuclear Notebooks' series considers all *Sierra*-class submarines to carry the SS-N-21, the *Sierra I* submarine is not equipped with the necessary flight-preparation electronics to operate the SS-N-21, and therefore this estimate does not include the *Sierra I* submarine.

Seaborne Anti-Ship Missiles

The Russian navy currently operates six nuclear-capable, seaborne, anti-ship missile systems, which are amalgamated under five Western designations: SS-N-2c, SS-N-9, SS-N-12, SS-N-19 and SS-N-22.[19] These missile systems are deployed on twenty-three active surface combatants of eight different classes, and on five active *Oscar II*-class submarines.[20] As all Russian naval ASM bombers have been transferred to the air force, and the warheads assigned to these systems are discussed in Chapter IV. A Russian newspaper closely associated with the Russian president has quoted an unnamed military official as saying that the Russio-Indian Brahmos collaborative cruise missile will also be nuclear-capable.[21] As such, the SS-N-26 missile, which represents the basis of Russia's part of the Brahmos collaboration, will most likely also be nuclear-capable.[22] The only SS-N-26 missiles in active service are deployed for coastal defence, and are discussed below.

The manner in which non-strategic nuclear warheads are assigned to these systems is dictated by the tactics used in their employment. To saturate, and then penetrate, the air-defence systems of a target, these ASMs are fired in

a dispersed salvo to prevent a concentration of defensive fire. The avionics aboard contemporary Russian ASMs automatically discriminate main and secondary targets, and then distribute these targets among the missiles within a single salvo. The standard structure of a 'full' strike of SS-N-12 and SS-N-19 ASMs consists of one or more (possibly several) salvos of eight

Table 11: Non-Strategic Nuclear Warheads Assigned to ASMs.

		SS-N-2C		SS-N-9		SS-N-12		SS-N-19		SS-N-22		
Class	**No.**	**ASMs**	**Whds**	**ASMs**	**Whds**	**ASMs**	**Whds**	**ASMs**	**Whds**	**ASMs**	**Whds**	**Total Whds**
Oscar II SSGN	5							24	3			**15**
Kuznetsov CV	1							12	2			**2**
Mod. *Kirov* CGN	1							20	3			**3**
Slava CG	3					16	2					**6**
Sovremenniy	2									8	1	**2**
Udaloy II DDG	1									8	1	**1**
Mod. *Kashin* DDG	1	4	1									**1**
Nanuchka	12			6	1							**12**
Dergach	2									8	1	**2**
TOTAL												**44**

Source: Author's calculations.

missiles each. As with anti-ship missile strikes carried out by Backfire aircraft, only one missile in each salvo is armed with a nuclear warhead.[23] This nuclear-tipped missile will always be assigned to strike the primary target among any group of targets.[24]

These longer-range ASMs (SS-N-12/19) could also be employed against land-based targets as a secondary mission.[25] However, the switch to secondary missions would only occur once the primary anti-ship missions had been completed. In this case, vessels would use any warheads remaining from the primary mission, and no extra assignment of warheads for this secondary mission would be needed.

Estimating assignment rules for the three remaining classes of ASM is challenging. Without any information to the contrary, it is reasonable to assume that the assignment logic for the SS-N-12/19 systems can be applied to the SS-N-22 system: therefore, that the SS-N-22 system employs a salvo of approximately eight missiles, one of which is nuclear-tipped. The older SS-N-2c system employs a salvo of only four missiles, one of which is nuclear-tipped.[26] This system is deployed on only one ship; the mod. *Kashin*-class destroyer *Smetliviy*. Finally, a predecessor of the SS-N-9 (the SS-N-7) similarly operated a salvo of four missiles with one nuclear-tipped missile.[27]

The SS-N-9 is carried only on the *Nanuchka*-class missile corvette, with six missiles. Assuming a similar counting rule, and considering that a nuclear capability is only optional for this rank of ship, it is reasonable to round this down to one nuclear warhead per 1.5 salvos.

If the number of ASMs available on any one ship is translated into approximate groups of salvos, and it is assumed each salvo is assigned one nuclear warhead, it is estimated that the Russian navy has forty-four non-strategic nuclear warheads assigned to its available ASMs. An important difference between this estimate and that produced by the 'Nuclear Notebook' series is that the latter considers the fourth-rank *Tarantul*-class missile boat to be nuclear-capable. As discussed above, standard Russian naval practices exclude all fourth-rank vessels from operating nuclear weapons. The nuclear status of this boat is not clear within 'World Nuclear Forces'.

Shipborne Air-Defence Systems

The range of most Russian naval air-defence systems is far too small to make the use of even low-yield, non-strategic nuclear weapons feasible. However, there are two important exclusions to this rule. The SA-N-6/20 and SA-N-3 area-defence systems both operate at ranges that make a nuclear capability possible. Although the throw-weight (warhead capacity) and design of the latter (80–120 kg, designed in early 1960s) has not been modified to accommodate modern, light-weight nuclear warheads, there are a number of reasons to consider that this nuclear potential might be fulfilled in the former.

Table 10: NSNW Assigned to Air-Defence Systems.

Class	No.	SA-N-6 battalions	SA-N-20 battalions	Assigned warheads
Mod. *Kirov* CGN	1	1	1	2
Slava CG	3	1		3
TOTAL				**5**

Source: Author's calculations.

The shipborne SA-N-6/20 air-defence missile system is very closely related to the land-based SA-10/SA-20 air-defence systems, discussed in Chapter III, which are here considered to possibly be assigned nuclear warheads. While there are a number of reasons as to why this may not be the case,[28] references made by a Russian warhead designer make explicit mention of warheads designed specifically for this system.[29] Given the similarities between these land-based and shipborne systems, it is not unreasonable to assume that the latter might operate non-strategic warheads, just like the former.

It is also telling that Russian shipborne air-defence systems are also organised into battalion equivalents in the same manner as their land-based

counterparts, suggesting that similar assignment rules can be used. Without further information to suggest otherwise, it can be assumed that one warhead would be assigned to each SA-N-6/20 battalion equivalent. Given that there are four ships in the Russian navy operating a total of five SA-N-6/20 battalion equivalents,[30] this suggests a maximum of five non-strategic warheads would be assigned to these systems. Unlike estimates made within 'World Nuclear Forces' (2011), this estimate does not consider the SA-N-3 or the SA-N-1 naval air-defence systems to have any nuclear warheads assigned to them.

Coastal Defence Anti-Ship Missile Systems

Of the four anti-ship coastal-defence missile systems currently in active service in Russia, two are known to be nuclear-capable and a third could potentially be nuclear-capable. The SSC-1a, the SSC-1B and the SSC-3 were all designed in the 1960s, when dual-capability was designed into these systems as standard.[31] The newer SSC-5 system uses the SS-N-26 missile, which (as discussed in the above anti-ship missile section) could potentially be nuclear-armed.[32]

Historical information relating to the deployment of the older SSC-1a Sopka system suggests a non-strategic warhead assignment rule which can be applied to more contemporary coastal-defence systems. It is thought that the four battalions of the SSC-1a deployed in Cuba during the 1962 crisis were assigned six non-strategic nuclear warheads.[33] As these forces were meant to operate (if not fight constantly) for two or three years, this assignment represents a maximum, rather than a limited, 'first-row' assignment. Given the similar inaccuracies of the SSC-1a, SSC-1b and SSC-3, it is not unreasonable to extend this assignment rule of two warheads per battalion among these systems. If this rule is assigned to the six SSC-1b battalions and two SSC-3 battalions currently in service, this produces an estimate of sixteen operationally assigned non-strategic nuclear warheads. If the two active battalions within the SSC-5 system are included, this increases the estimate to twenty assigned warheads. Other estimates, notably those within the 'Nuclear Notebooks' series and within studies conducted by the Federation of American Scientists, consider neither the SSC-3 nor the SSC-5 systems to be assigned nuclear warheads.

Notes and References

1. Cruisers, large destroyers and all strategic and fleet nuclear-powered submarines are ships of the first rank; frigates and the majority of diesel-electric submarines are of the second rank; large corvettes are of the third rank; and torpedo and missile boats belong to the fourth rank.

2. Evgeny Shitikov, 'Nuclear Weapons' in A Sarkisov (ed), *Russian Science for the Navy* (in Russian) (Moscow: Nauka Publishing House, 1997), pp. 293–96.

3. Ministry of Foreign Affairs of the Russian Federation, 'Statement of The Delegation of the Russian Federation at the First Session of the Preparatory Committee for the 2005 NPT Review Conference under Article VI of the Treaty', 11 April 2002, <http://www.partnershipforglobalsecurity.org/Official%20Documents/Russian%20Government/Ministry%20of%20Foreign%20Affairs/821200310127PM.html>, accessed 30 October 2012.

4. Deputy Prime Minister and Minister of Defence Sergei Ivanov announced in a 10 September 2006 meeting with President Vladimir Putin that: 'There are five strategic submarines and three attack submarines at sea today [10 September] with combat patrol missions, but they all carry nuclear weapons aboard. The submarines differ by their tasks – some of them are intercontinental, others are multipurpose [attack] ones, but they all carry nuclear weapons aboard'. See Pavel Felgengauer, 'Ivanov has Joyfully Taken on Nuclear Weapons' (in Russian), *Novaya Gazeta*, 14 September 2006.

5. Author interview with active naval officers that served in both Soviet and Russian navies.

6. Anatoliy Veselovsky (The VNIIEF [Arzamas-16] nuclear laboratory's former chief designer of nuclear warheads) mentions in his memoirs that VNIIEF created nuclear warheads for both the missile systems designated as SS-N-15 in the West, as well as for SS-N-14 and SS-N-16. See Anatoliy Veselovskiy , '65 Years of the Glorious History: The Key to Stability and Development', *PRO-Atom Agency*, 2 March 2011, <http://www.proatom.ru/modules.php?name=News&file=article&sid=2858>, accessed on 26 October 2012.

   There is evidence to suggest that Russia plans to maintain its nuclear-capable ASW missile systems into the future. According to Russian sources, the 81R Vjyuga, 84R Vodopad and 84RN Vodopad-NK (taken together, the SS-N-15), and the 85RUS Rastrub-B (SS-N-14) and 88R Veter (SS-N-16) modifications of the corresponding Russian ASW missiles carry nuclear warheads instead of a homing torpedo. See 'Russian Power Forum', *otvaga2004.ru*, 7 January 2010, p. 1, <http://otvaga2004.mybb.ru/viewtopic.php?id=128>, accessed 28 October 2012.

   As of 2009, 85RUS missiles (the nuclear-tipped variant of the improved 85RU Rastrub/SS-N-14 ASW/anti-ship missile) have been undergoing a life-extension programme. See: Russian Federation State Tender No. 091103/001233/1628, 'Service Life Extension and Repair of Missile Complexes', 5 November 2009, <http://www.mos-tenders.ru/info.php?id=721118>, accessed 28 October 2012.

7. An example of a retired nuclear torpedo is the 65-76A 650-mm, anti-carrier, wake-follower torpedo, equipped with the TV9 warhead. One of these torpedoes exploded within its tube onboard the *Oscar II*-class submarine *Kursk* in August 2000, leading to the

loss of the submarine and all 118 crew members. The investigation into this catastrophe led to the retirement of all torpedoes based on this design.

8. The TV17 warhead was purposefully designed for the USET-80 torpedo.

9. It has been indicated a number of times that Soviet submarines were equipped with two nuclear torpedoes/ASW missiles as standard between 1960 and 1980. For instance, historical records regarding losses of *November*-, *Yankee*-, and *Mike*-class submarines indicate such a loading: NV *Karpan*, *Chernobil.* See 'Peaceful Atom's Revenge' (in Russian), *physiciansofchernobyl.org.ua*, p. 10, <www.physiciansofchernobyl.org.ua/rus/books/Karpan/24.pdf>, accessed 28 October 2012.

10. It was not unusual for the Soviet navy to be compared to a blind heavyweight boxer: it was able to deliver an extremely heavy blow, but did not know where best to deliver it.

11. 'Moskva Anti-submarine Cruiser' (in Russian), *Military Journal: Electronic Military-Historic Magazine*, 26 April 2011, <http://military-journal.com/index.php/2011-04-26-11-32-11/141---lr?showall=1> , accessed 24 September 2012.

12. Twelve Ka-25PL ASW helicopters, one Ka-25Ts targeting helicopter for over-the-horizon targeting of the SS-N-3 ASM, and one Ka-25PS search-and-rescue helicopter.

13. The *Kashin*-class destroyers were equipped only with helicopter landing decks, but were not assigned helicopters. The *Kashin*-class *Otvazhniy*, lost on 30 August 1974 after a fire and the explosion of the aft SA-N-1 magazine, carried a magazine of helicopter depth bombs.

14. See for example: 'Amphibious Aircraft Be-12 (Item "E")' (in Russian), *Aviateknika*, <http://aviation.gb7.ru/Be-12.htm>, accessed on 28 October 2012.

15. To comply with the SALT II Treaty limitations, the Soviet Union opted to cut off missile compartments of *Yankee I* SSBNs and insert compartments with eight torpedo tubes and storage for cruise missiles or heavy torpedoes instead.

16. The warheads assigned to those vessels in reserve or under refurbishment are similarly held back in reserve, and are not operationally assigned. See Chapter IX.

17. '*Komsomolets*-type Nuclear-powered Torpedo Submarine: Project 685 – *Mike*-class' (in Russian), *Atrina: Soviet and Russian Warships (1945–2005)*, <http://atrinaflot.narod.ru/1_submarines/03_pla_685/0_685.htm>, accessed 28 October 2012.

18. 'Large Torpedo Submarine "Project 685 *Plavnik*"' (in Russian), *russian-ships.info*, <http://russian-ships.info/podlodki/685.htm>, accessed 24 September 2012

19. There is another potentially nuclear-capable anti-ship missile. The preliminary version of the universal SS-N-26 ASM for submarines, surface combatants, air and coastal defence was ready in 1983, at the height of the Soviet NSNW programme. (It is important to note, however, that the SS-N-26 is currently only operationally deployed for coastal-defence systems.) As the SS-N-26 was a competitor to the nuclear-capable SS-N-22 ASM, it must have all of the key features of the SS-N-22, including a nuclear capability. See V Litovkin, 'The West Has Found a New Weapon in Russia. It is the Well-Known Old Weapon to Us' (in Russian), *Izvestiya,* 7 August 1999, p. 6.

    Some argue that the lower throw-weight of the SS-N-26 compared with the SS-N-22 (200–250 kg compared to 300–320 kg) casts doubt on the SS-N-26's nuclear capability. However, given that the TK60 warhead, designed for guided missiles, weighs only 90 kg, this diminished throw-weight does not rule out a nuclear capability. (See D Baranets, '12 Billion Dollars for the Weapons which no-one Else Has' (in Russian), *Komsomolskaya pravda*, 7 August 1997, p. 1.) Similarly, the TK43 warhead, mass-produced for use on the air-to-surface AS-9 missile, weighs only 155 kg. The TK57-08 warhead designed for the AS-13 air-to-surface missile also weighed only 149 kg. As such, there is no technical reason to rule out the assignment of a nuclear warhead to the SS-N-26 ASM. Despite this, there is no clear and available information to suggest that the one missile corvette (of a modified *Nanuchka*-class *Nakat* missile ship) that carries the SS-N-26 system actually utilises this nuclear-capability. As such, this estimate does not assign any warheads to the SS-N-26 system mounted on this single missile corvette.

20. 'Combat Ships of the Russian Federation-2012' (in Russian), *russian-ships.info*, <http://russian-ships.info/today/>, accessed 24 September 2012.

21. Alexey Mikhailov, 'Russo-Indian Anti-Ship Missile Has Become the Strategic One' (in Russian), *Izvestiya*, 8 October 2012.

22. Sergey Sokut, 'Long Arms for Aviation and Navy' (in Russian), *Nezavisimoe voennoe obozrenie*, 24 August 2001, <http://nvo.ng.ru/wars/2001-08-24/7_hands.html>, accessed 30 October 2012.

23. M Knyazev, 'Aircraft Carriers Could Wait a Bit' (in Russian), *Military-Industrial Courier* (Vol. 26, No. 443, 4 July 2012), <http://vpk-news.ru/articles/9013>, accessed 30 October 2012; A Pavlov, 'Aircraft Carrier Killers: Missile Cruisers Project 1164' (in Russian), *Slava*, <http://wunder-waffe.ru/WeaponBook/1164/04.htm>, accessed 30 October 2012.

24. Pavlov, 'Aircraft Carriers Killers'.

25. Yuri Golotyuk, '"Peter the Great" Tests the Might of its Weapons' (in Russian), *Russkiy Telegraf*, 28 October 1997, p. 1.

26. The SS-N-3 ASM also belonged to the same generation as SS-N-2c. Meanwhile, one out of four SS-N-3 anti-ship missiles carried a TK11 nuclear warhead. See A Shirokorad, *Flaming Sword of the Russian Navy* (in Russian) (Moscow: Yauza-EKSMO, 2004), p. 195.

27. 'P-70 Ametist Anti-Ship Cruise Missile' (in Russian), Missile Techniques website, <http://rbase.new-factoria.ru/missile/wobb/ametis/ametis.shtml>, accessed 7 October 2012.

28. For instance, the technical restrictions on low-altitude nuclear strikes and the difficulties in servicing hermetically sealed warheads discussed in Chapter III.

29. Veselovskiy, '65 Years of Glorious History'.

30. The extremely small number of nuclear warheads supposedly stored for issuing to shipborne, nuclear-capable, air-defence units is the additional reason for the author to believe that actually there are no operationally available air-defence nuclear warheads assigned to any surface combatants of the Russian navy. Indeed, such a small amount of highly specialist weapons (warheads must be designed to withstand unfavourable conditions of service aboard of seagoing platforms) makes it extremely expensive to maintain such a niche but small stockpile. However, in the absence of information to the contrary, the author is led to assume the existence of these weapons and include them in the estimate of the overall size of the Russian NSNW stockpile.

31. *Missile Systems News and Informational System*, '4K51 *Rubezh* coastal-defence anti-ship missile complex' (in Russian), <http://rbase.new-factoria.ru/missile/wobb/rubeg/rubeg.shtml>, accessed 30 October 2012.

32. The prospective nuclear variant of SS-N-26 missile used in SSC-5 missile system is discussed in the 'Sea-Borne Anti-Ship Missiles' section of this chapter.

33. The Soviet order of battle on Cuba, during Operation *Anadyr* in 1962, can be found (in Russian) at <http://www.waronline.org/write/world-military/russian-military-abroad/cuba/>, accessed 30 October 2012.

VI. Ground Forces

RUSSIAN ground forces currently operate two types of short-range ballistic missile: the SS-21 Tochka and the SS-26 Iskander. At present, there are a total of ten missile brigades, six of which are armed with only the SS-21, two are armed with only the SS-26, and one is armed with both systems,[1] and a final brigade under the control of the navy operates only the SS-21. Each of these ten missile brigades is comprised of three missile battalion sub-units. These missile battalions in turn are comprised of two batteries of two missile launchers each. As such, each missile brigade is comprised of three battalions of four launchers, or twelve launchers in total.

Table 12: Non-Strategic Nuclear Warheads Assigned to Russian Ground Forces.

	Brigades/ battalions	Warheads assigned per unit	Total assigned warheads
SS-21 and SS-26 short-range ballistic missiles	10/2	12–18	128–92
Nuclear artillery	0/9	0–2	0–18
TOTAL			**128–210**

Source: Author's calculations.

In addition to these ten missile brigades are two independent battalions; one of which deploys the SS-21 system in South Ossetia, the other deploying the SS-26 for training and test-flight purposes in Kapustin Yar.

Officially, Russia has 'eliminated' all nuclear warheads associated with its ground forces as part of its unilateral obligations under the 1991–92 Presidential Nuclear Initiatives. These would include all warheads for short-range ballistic missiles, nuclear artillery projectiles and demolition munitions.[2] These promises, made towards the end of the Soviet Union by Gorbachev, were subsequently confirmed and expanded by Yeltsin, who stated in 1992 that the production of such warheads had also been terminated.[3]

While it was announced that this elimination was to finish between 1998 and 2000,[4] there are some convincing reasons to doubt that Russia has yet to fully carry out this particular aspect of its PNI promises. In 2002, Russia declared to a preparatory meeting for the Nuclear Non-Proliferation Treaty conference that it had 'practically' implemented all of its PNI obligations, 'with the exception of elimination of nuclear weapons in the army'.[5] By 2007, an official statement published by a Russian newspaper suggests that Russia might have been trying to soften its earlier PNI promises by stating that it had only committed itself to 'removing', rather than eliminating, nuclear weapons from its ground forces.[6] While there is no information that suggests Russia still maintains man-portable nuclear-sabotage warheads or demolition warheads,[7] there is information that fuels suspicion that Russia

may still maintain some non-strategic nuclear warheads for its ground forces, and that it has both the capabilities and plans with which to deploy them.

Short-Range Ballistic Missiles

It has been known for some time that the SS-21 missile system is nuclear-capable. However, some uncertainty remains over the nuclear capability of the SS-26 system. While the SS-26 system is currently not equipped with sufficient climate-control systems to operate non-strategic nuclear warheads, given the system's modular design, this could be remedied. Indeed, information regarding the nuclear capability of the new SS-26 short-range ballistic missile is repeated too often to be considered simply rumour. For instance in 1997, when Russia was supposed to have been eliminating nuclear warheads from its ground forces, it was openly stated by official sources that highest-priority military programmes included a 'new tactical nuclear system capable of delivering nuclear warheads to a range of 400 kilometers'.[8] Both the timing of this statement, and the quoted range, strongly suggest that this programme produced the SS-26 Iskander system.[9] Similarly, newspaper reports relating to 1999 decisions within the Russian Security Council quote decisions that explicitly did not rule out a nuclear capability for the SS-26 system.[10] Since then, there have been further public announcements that suggest that the SS-26 is nuclear-capable.[11]

A Wikileaks document suggests that recent military exercises in the Baltic region and the Russian Far East involved simulated nuclear launches from unspecified tactical ballistic-missile systems,[12] which also suggests that the older SS-21 system (originally designed to be nuclear-capable) maintains its nuclear role, and that such a role could also have been developed for the SS-26.

Given that the SS-26 was produced after Russia made a promise within the PNIs to eliminate all non-strategic nuclear warheads within its ground forces, it would have to create a 'new' warhead for the system in contravention to these promises. To do so would not necessarily require the re-initiation of warhead production lines halted under the PNIs. The design of Russian warheads requires components to be regularly replaced or refurbished with new components, so as long as Russia maintains related non-strategic nuclear warheads, its warhead production lines will remain active. Similarly, Russia can draw upon its vast experience using standardised warhead sections (which themselves contain standardised warheads) on different missiles. For instance, both the now-obsolete 9M21 FROG-7 missile and the 9M79B missile employed on the SS-21 system used the same 9N39 warhead section containing the AA60 warhead. It is perfectly possible that the SS-26 system can similarly employ warhead sections (and warheads) previously or currently deployed on other systems;[13] indeed, the basic characteristics of the SS-21 and SS-26 warhead sections are very similar. The 9N39 section

(containing the 10-kiloton AA60 warhead) employed on the SS-21 weighs 482 kg,[14] while the section employed on the SS-26 weighs 480 kg.[15]

Finally, an interesting news release available on the official Russian Ministry of Defence website not only further feeds suspicions that Russia's short-range ballistic missiles retain a nuclear role, but also that Russia's artillery may retain a similar role. The Russian MoD reported in 2011 that specialist units within Russia's ground forces received 'more than 100 cranes reliable enough to handle nuclear warheads'.[16] At the very least this suggests that Russia's ground forces still have a reason to maintain a capability to load and unload nuclear warheads. If one digs deeper, there are suggestions that even Russia's probably-nuclear short-range ballistic missile brigades would not need 'more than 100' cranes to operate fully, and that the remaining cranes may be intended for Russia's artillery.

Nuclear Artillery

As discussed in Chapter II, the transportation of non-strategic nuclear warheads from centralised storage to military units is carried out by the 12th GUMO. However, once these warheads are delivered to units, further handling is the responsibility of technical teams within an individual unit (a battalion, in the case of short-range missile forces). Given the criticality of the task, one can assume that the loading or off-loading of nuclear warheads is carried out one by one, rather than by moving several warheads at a time. As there are only two missile batteries within each battalion, it is likely that each missile battalion is assigned at most two cranes: one for loading and unloading both nuclear and conventional missiles, and one spare.

While there are plans to upgrade all short-range ballistic missile battalions to use the newer SS-26 system rather than the SS-21 system, this would not change the overall number of missile battalions. If one excludes the missile brigade under the control of the navy, which has its own separate engineering service, twenty-seven missile battalions within the ground forces could conceivably need such cranes. Keeping in mind the need to maintain some equipment in training centres, this represents a need of only fifty-five to fifty-eight cranes, not over 100.

If at a minimum only 100 cranes were in fact supplied, this would leave sufficient cranes for approximately twenty-one more battalions. There are nine battalions of Russia's 'artillery of utmost power' in active service, and equipment stored for fifteen to sixteen further battalions. As one can assume that these battalions are assigned 'nuclear-capable' cranes in the same manner as missile brigades, it is possible these remaining cranes have been assigned to these units (which consist of 2A36 and 2S5 Giatsint 152-mm and 2S7 Pion 203-mm guns, and 240-mm Tyulpan mortars).

While it is commonly assumed that Russia's artillery no longer maintains a nuclear role, there is further information that suggests that this might not be the case. Russian media reports relating to the approval of the Russian Security Council's 1999 'Concept on the Development and Employment of Russia's Non-Strategic Nuclear Weapons' suggest that this development concept explicitly referred to nuclear-capable artillery.[17] One report suggested that this concept mainly emphasised the issue of extending the life of non-strategic nuclear weapons,[18] while a second suggested that three documents signed by the Russian president as part of this concept included mention of 'nuclear warheads for [tactical] missiles and artillery projectiles with range of up to 40 kilometres'.[19] If this was made in the context of warhead life extension, this raises an important point: if Russia truly planned to eliminate all warheads for its artillery forces, it should not need to concern itself with the life-extension of these warheads just one year before their elimination date.

Importantly, if warheads for nuclear artillery still exist, there are no significant barriers to their eventual employment. Within the first half of 1970, at least three types of nuclear-capable shells were developed which could still be in use today: the 3BV2 203-mm projectile, the 3BV3 152-mm projectile, and the 3BV4 240-mm nuclear mortar shell for the M-240 and 2S4 mortars.[20] This information is by no means conclusive, and it is still highly uncertain whether or not Russia still assigns a nuclear role to its artillery forces. To err on the side of caution, this estimate assumes a range of values for warheads assigned to Russia's ground forces, rather than a definite number.

Assignment Rules

Short-Range Ballistic Missiles

To postulate warhead assignment rules for these possibly nuclear systems, it is useful once again to turn to the Soviet Union's deployment of warheads in Cuba. However, the two different non-strategic ballistic-missile systems deployed in Cuba were assigned warheads according to different standards.

First, three regiments of the SS-4 missile system were issued thirty-six warheads in total. As these regiments contained a total of twenty-four launchers, this represents enough warheads for 1.5 full salvos.[21] This assignment standard has been confirmed by officers who served within Warsaw Pact missile brigades, whose memoirs state that each East German army missile brigade (armed with Scud-C and SS-21 missile systems) was also assigned enough warheads for 1.5 full missile salvos (eighteen warheads for one brigade of twelve launchers).[22]

Secondly, the two regiments of the SS-5 missile system received twenty-four nuclear warheads. As each regiment contained twelve launchers,

this suggests that the SS-5 was assigned only enough warheads for one salvo (rather than one-and-a-half).[23] In addition, a 1962 memorandum for additional deployments to Cuba suggests that one SS-1A Scud-A missile brigade (of eighteen launchers) was to be deployed and similarly assigned eighteen warheads.[24] Although the SS-21 and SS-26 are naturally more sophisticated and accurate than both the SS-4 and SS-5 systems, there is no additional information regarding warhead-assignment standards for short-range ballistic missiles. As such, both of the historical assignment standards above are considered, and each brigade of short-range missiles currently in service is thought to be assigned either twelve or eighteen warheads (for the twelve launchers contained in each).

The two independent SS-26 missile battalions that are deployed in South Ossetia and at the Kapustin Yar test-and-training site are also considered to have warheads assigned to them, despite not being integrated into a larger brigade-sized unit. The South-Ossetian battalion still maintains an official combat readiness, and the swift combat deployment of the Kasputin Yar battalion during the 2008 Georgian conflict suggests it might also retain full combat readiness (despite being ostensibly for test and training purposes only). If both maintain full combat readiness, it is reasonable to assume that they are assigned similar tasks to other missile regiments, and are assigned munitions accordingly. As such, it is assumed that each independent battalion (of four launchers) is assigned either four or six non-strategic nuclear warheads (as either warheads for one full salvo, or 1.5 full salvos).

On the basis of these two assignment rules, the ten brigades and two independent battalions of short-range missile systems in active service are assigned either 128 or 192 non-strategic nuclear warheads.

Nuclear Artillery

Just as there is little concrete information regarding the nuclear capabilities of Russia's ground short-range missile forces, there is little information available about the warhead-assignment standards for Soviet artillery systems that are known to be nuclear-capable. The only information available suggests that two nuclear artillery projectiles were assigned to a single artillery regiment.[25] In the absence of any more contemporary information, this assignment standard has to be translated from Soviet-era regiments to Russian battalions. Although the latter contains fewer guns, it is conservative to assume that if Russia's artillery battalions are assigned nuclear warheads, two are assigned to each active battalion.

It is important to point out here that there are only nine nuclear-capable artillery battalions in active service;[26] the equipment held in storage can hardly be thought of as active, and warheads would not be assigned to these 'potential' battalions in a high state of readiness in any case. If these nine

battalions are indeed assigned non-strategic nuclear warheads, it is probable that eighteen such warheads would be assigned.

Comparison with Existing Estimates

This estimate suggests that Russia maintains between 128 and 210 warheads operationally assigned to its ground forces. While the quantity suggested here does not differ dramatically from those of the established estimates, with 'World Nuclear Forces' suggesting approximately 164 and 'Nuclear Notebooks' proposing 170, this study's outline of the way in which these warheads are distributed is different. While 'Nuclear Notebooks' gives little information as to how it arrived at its conclusion, 'World Nuclear Forces' assigns one warhead to each of the 174 deployed short-range missile launchers.[27] While this assignment standard is equivalent to the lower 'one full salvo' rule used here, it is applied to forty-six more launchers than are considered in this estimate. Finally, while both 'Nuclear Notebooks' and 'World Nuclear Forces' do not consider Russia's artillery to be nuclear-capable, this estimate entertains this possibility, increasing its upper range of the total number of warheads potentially by eighteen.

Notes and References

1. The 1st Guards Missile Brigade in Krasnodar is currently undergoing a rearmament process, which is the reason for the mixed composition of its missile systems.

2. *Krasnaya Zvezda* (*Red Star*), 'Address by President Mikhail Gorbachev of the USSR for Soviet Television' (in Russian), 8 October 1991, p. 1.

3. *Krasnaya Zvezda*, 'Boris Yeltsin: Russia Is Devoted to the Course towards Radical Nuclear Weapons Reduction' (in Russian), 30 January 1992, p. 3.

4. *Krasnaya Zvezda*, 'The Fatherland's Armed Forces Today and Tomorrow: Army General Vladimir Lobov on the Problems of Military Reform' (in Russian), 29 November 1991, p. 2; Bruce G Blair, *The Logic of Accidental Nuclear War* (Washington, DC: The Brookings Institution, 1993), p. 105.

5. Ministry of Foreign Affairs of the Russian Federation, 'Statement of the Delegation of the Russian Federation at the First Session of the Preparatory Committee for the 2005 NPT Review Conference under Article VI of the Treaty', 11 April 2002, <http://www.partnershipforglobalsecurity.org/Official%20Documents/Russian%20Government/Ministry%20of%20Foreign%20Affairs/821200310127PM.html>, accessed 31 October 2012.

6. 'Russia Determined to Keep Tactical Nuclear Weapons for Potential Aggressors', *Pravda*, 31 October 2007.

7. There were at least four types of munitions of both classes – RA41, RA47, RA97, and RA115 – designed and deployed in the Soviet Union; there are unconfirmed reports of the previous existence of a fifth type – the RYa6 man-portable nuclear munition.

8. V Baranets, '12 Billion Dollars to Spend on Weapons that No-one Else Possesses' (in Russian), *Komsomol'skaya Pravda*, 7 August 1997, p. 1.

9. There were numerous Russian media publications at that period which openly stated the range of the SS-26 Iskander to be 400 kilometres. See, for instance, S Novikov, 'We Produce Missiles Once Again' (in Russian), *Segodnya*, 21 December 1995, p. 9; O Falichev, 'Military Reform is the Reply to the Challenges of the Present Period: Interview with Colonel-General Valeriy Manilov, the First Deputy Chief of the General Staff', *Krasnaya Zvezda*, 12 January 1999, p. 2.

10. *Nezavisimaya gazeta* reported that: 'Yesterday [29 April 1999], the Russian President signed three documents. One of them defines the tactical nuclear weapons development programme. It is not excluded in this context that the Iskander operational-tactical missile system which is under development will now be equipped with a nuclear warhead'. Author's translation, cited in I Korotchenko, 'National Nuclear Complex is Ruining Russia' (in Russian), *Nezavisimaya gazeta*, 30 April 1999, p. 2.

11. See, for instance, D Telmamov, G Melnik and I Kramnik, 'Iskanders will Respond to False Threats of BMD: The Ministry of Defence will Present Nuclear-Capable Tactical Missile Complexes' (in Russian), *Izvestia.ru*, 17 October 2011, <http://www.izvestia.ru/news/504140>, accessed 31 October 2012; Dariya Antoshko, 'Rogozin has been Moved Away from NATO' (in Russian), *Izvestia.ru*, 25 April 2012, <http://www.izvestia.ru/news/523046>, accessed 31 October 2012. Anatoliy Veselovsky, who was for years responsible for testing nuclear warheads for Russian short- and long-range ballistic missiles, openly stated in his memoirs that VNIIEF (Arzamas-16) had designed a nuclear warhead for the SS-26 Iskander missile. Anatoliy Veselovsky, 'On the history of VNIIEF' (in Russian), *proatom.ru*, <http://www.proatom.ru/modules.php?name=News&file=article&sid=2858>, accessed 31 October 2012. This fact is recognised in the United Kingdom, too: a BASIC Trident commission report of November 2011 mentions a 'new [Russian] nuclear capable short range missile being deployed to 10 army brigades over next decade' – a description which perfectly fits the Iskander missile: see Ian Kearns, 'Beyond the United Kingdom: Trends in the Other Nuclear Armed States', discussion paper no. 1 of the BASIC Trident Commission, November 2011, p. 4, <http://www.basicint.org/sites/default/files/commission-briefing1.pdf>, accessed 31 October 2012.

12. *Aftenpostern,* 'North Atlantic Council Discusses Russian Military Exercises', 23 November 2009, <http://www.aftenposten.no/spesial/wikileaksdokumenter/article4028273.ece>, accessed 31 October 2012.

13. There are a number of other examples where this has been the case. The RDS-4 warhead was employed on nuclear bombs, surface-to-air missiles, short-range ballistic

missiles, SLBMs and cruise missiles. The TK80 warhead is also employed aboard the very different SS-N-12, SS-N-19 and SS-N-22 anti-ship missile systems. The warhead known as 'Item 255A' was used on nuclear bombs, air-to-ground missiles and SLBMs. Finally, the TV9 and TV10 warhead sections (for 650 mm and 533 mm torpedoes) employed the same internal warhead systems, which formed the basis of the higher-yield warhead for ICBMs.

14. While the 9N64/AA86 (entered service in 1981) and 9N65/AA92 (after 1988) warhead assemblies of SS-21 missiles are much newer than the 9N39/AA60 (1978), they reportedly have a much higher yield. While it is probable that these newer warheads could have a variable yield, it is hard to understand why Russian designers would waste nuclear materials if lower yields were ever deemed sufficient.

15. *Armyman.info*, 'Iskander Precision-Guided Missile System', <http://armyman.info/rakety/raketnye-kompleksy-obschego-naznacheniya/2905-vysokotochnyj-raketnyj-kompleks-171iskander187.html>, accessed 31 October 2012.

    The 9N72/AA75 warhead assembly for the SS-23 missile might be a more probable option for the SS-26. The SS-26 was designed as a substitute to the 400-km range SS-23 eliminated under the INF Treaty. Indeed, the geometry of the 9N72 and 9N722 (for the SS-26) warhead sections are strikingly similar. Although the AA75 warhead used on the SS-23 weighs 375 kg, as the SS-26 mod. 2 (*Iskander*-M) can carry a 720 kg conventional warhead. See: 'Oka Operational-Tactical Missile System' (in Russian), *armyman.info*, <http://armyman.info/rakety/raketnye-kompleksy-obschego-naznacheniya/2906-operativno-takticheskij-raketnyj-kompleks-9k714-171oka187.html>, accessed 31 October 2012.

16. The Russian Ministry of Defence press service, 'During 2011, the Engineer Troops have Received New, Specialist Machinery and Equipment' (in Russian), 23 December 2011, <http://www.function.mil.ru/news_page/country/more.htm?id=10859461@egNews>, accessed 31 October 2012.

    This was announced to journalists by the Russian Ministry of Defence press spokesperson for ground forces, Lieutenant-Colonel Sergey Vlasov: 'The Troops have Received Cranes to Handle Nuclear Weapons', *b-port.com*, 7 January 2012, <http://www.b-port.com/news/item/73744.html>, accessed 31 October 2012.

17. A Koretskiy, 'The Poke by Nuclear Umbrella' (in Russian), *Segodnya*, 30 April 1999, p. 1.

18. I Bulavinov, I Safronov, 'Yeltsin Ordered to Patch the Nuclear Shield' (in Russian), *Kommersant*, 30 April 1999, p. 1.

19. V Ermolin, 'Russian Arms Infantry with Nuclear Weapons' (in Russian), *Izvestiya*, 30 April 1999, p. 2. The range quoted here matches that in open-source information in relation to the 2S7 Pion 203 mm gun employed by Russian ground forces (between 37.5 km and

47 km depending on the projectile); see *military-today.com*, '2S7 Pion: 203-mm self-propelled gun', <http://www.military-today.com/artillery/2s7_pion.htm>, accessed 31 October 2012.

20. While one might think mortars do not have sufficient range for nuclear use, the 2S4 mortar projectiles are thought to have a range of 20.4 km, which is similar to the US M109A3/A6 self-propelled howitzers (which are typically considered to be nuclear-capable). This is supported by the designation of Soviet 240 mm mortars in the *The Military Balance 1987–88* as nuclear-capable. See *Armaments Encyclopedia*, 'M109 155-mm howitzer', <http://detavlad.ru/item/111>, accessed 31 October 2012; IISS, *The Military Balance 1987–1988* (Abingdon: Routledge for IISS, 1987), p. 34.

21. The order of battle for the Soviet troops deployed in Cuba in 1962, as part of Operation *Anadyr*, can be found at *waronline.org* (in Russian), <http://www.waronline.org/write/world-military/russian-military-abroad/cuba/>, accessed on 26 October 2012.

22. Interviews conducted by Otfried Nasauer, director of the Berlin Information Centre for Transatlantic Security, with former East German army missile troop officers, carried out in support of this RUSI study.

23. See *waronline.org*, previously cited. Alternative sources state that there were just sixteen launchers in two R-14/SS-5 regiments, which means the same 'one-and-a-half salvo' assignment rule of nuclear warheads.

24. *waronline.org*, <http://www.waronline.org/write/world-military/russian-military-abroad/cuba/>, accessed on 26 October 2012.

25. Author interview with a former Soviet artillery officer serving in the Siberian military district.

26. Consisting of 2A36 and 2S5 Giatsint 152-mm guns, 2S7 Pion 203-mm guns, and 240-mm Tyulpan mortars.

27. It is not clear how a total estimate for ground forces of 164 warheads is reached from one warhead being assigned to each of 174 launchers.

VII. Estimating Russia's Reserve Weapons

TO gain an understanding of Russia's *overall* non-strategic nuclear warhead stockpile, it is necessary to look beyond operationally assigned warheads to those held in reserve. Although this collection of warheads is distinct from those operationally assigned (in that they cannot immediately be delivered by operational systems), these 'reserves' do not simply include all other warheads. Rather, their numbers are carefully controlled to meet medium- and long-term warhead requirements. Any other warheads that are surplus to these requirements enter a queue for dismantlement or recycling, are transferred out of military custody, and are no longer considered to be part of the overall non-strategic nuclear warhead stockpile.

Table 13: Russia's Overall NSNW Stockpile.

Stockpile element	Readiness level	No. of warheads
Operationally assigned	1	875–1,055
Warheads assigned to temporarily unavailable platforms	3	154–55
Strategic reserves	3	≈400
Spares	2–3	≈50
Warheads undergoing refurbishment	4	≈330

Source: Author's calculations.

Reserve warheads are held at varying levels of readiness (on a descending four-point scale, level one being combat-ready and level four being essentially unavailable), according to the requirements that they are intended to meet.[1] For instance, Russia's operationally assigned warheads are held at the highest (first) level of readiness, while warheads awaiting dismantlement or undergoing refurbishment are held at the lowest (fourth) level of readiness.

Estimating Russia's Reserve Stockpile

There are four likely requirements that drive the size and composition of Russia's reserve stockpile. The first element of Russia's reserves comprises *warheads assigned to temporarily unavailable platforms* (such as those undergoing repair or maintenance). These must be taken temporarily off combat-readiness and held aside at the third level of readiness until their delivery systems return to service. Estimating the quantity of these warheads is a relatively simple task: applying the same assignment rules described earlier to the available figures regarding temporarily unavailable platforms produces an estimate of the warheads assigned to them (for example, see Table 13). Unfortunately, estimating the remaining portions of Russia's reserves is not so simple.

Strategic Reserves

A 'strategic reserve' of warheads, held back to act as a 'second wave' of operationally assigned warheads, forms the second element of Russia's reserve stockpile. Given that these warheads would only come into play after all operationally assigned warheads are exhausted, this strategic reserve (like warheads assigned to temporarily unavailable platforms) would be held at the third level of readiness. The size of this 'second wave' would presumably be determined as a proportion of the first wave of operationally assigned warheads, rather than as an arbitrary number. This proportion would be based on assumptions regarding the number of warheads that would be needed and could be delivered in any second wave of assignments.

One historical source suggests there may be a way of characterising these assumptions. Quoting the January 1989 'Statement of the Warsaw Pact Defence Ministers Committee on the Correlation of Conventional Forces in Europe and in the Seas Adjacent to Europe', this source states that a total of 1,370 non-strategic nuclear warheads were held at the time in the Soviet stockpile for a total of 661 Scud missile systems.[2] If these Scuds are translated into approximate 'brigades' of twelve launchers each, and the maximum standard for non-strategic warhead assignments discussed in Chapter VI is applied, these missile systems should only require 990 operationally assigned warheads. It is possible that the additional 380 warheads comprise spare and strategic reserve warheads for this system. If approximately thirty warheads are 'spares' (discussed in the next section as one-thirtieth of the number of operationally assigned warheads), the remaining 350 warheads could potentially represent a second assignment of warheads, equivalent to approximately *one-third of the size of the first assignment* (990).

Spare Warheads

A third element of Russia's reserve stockpile comprises a small number of *spares* for all warheads not undergoing refurbishment or awaiting dismantlement. These are maintained to replace any warhead found to be faulty as it leaves centralised storage,[3] or as it is brought up to combat readiness. Spare warheads for those operationally assigned are held at the second level of readiness, while all others are held at the third. Again, rather than maintaining an arbitrary number of spares, these are most likely determined as a certain proportion of operationally assigned warheads, warheads assigned to temporarily unavailable platforms and the strategic reserve. As there is no reason to assume some warheads are more reliable than others, this proportion would likely be constant across all warhead types. Similarly, even though there may be more time to repair faulty warheads within the strategic reserve than in operationally assigned stocks, there is no reason to assume all faults can actually be fixed in time. As such,

this proportion may not change between elements of Russia's reserve that are held in differing states of readiness.

Table 14: Estimate of Nuclear Warheads Undergoing Repair or Maintenance.

		Non-Strategic Nuclear Weapons per Unit						
Unit	**No. Temporarily Unavailable**	**SLCM**	**Anti-ship missile**	**Anti-sub mssl/torp**	**Nuclear depth bomb**	**Air-defence missile**	**Nuclear artillery shell**	**Total NSNW**
Naval Forces								
Borey SSBN	2			2				4
Granay SSGN	1		3/4	2				5/6
Typhoon SSBN	2			2				4
Delta IV SSBN	2			2				4
Oscar II SSGN	4		3	2				20
Akula SSN	3	8		2				30
Sierra II SSN	1	8		2				10
Sierra I SSN	1			2				2
Victor III SSN	2	4		2				12
Kilo SS	5			2				10
Tango SS	1			2				2
Kirov CGN	2	3		1	1	2		14
Sovremenniy DDG	6	1			1			12
Udaloy DDG	1				1			1
Nuclear Artillery								
2S4 Battalion	1						2	2
2S7 Battalion	1						2	2
2S5 Battalion	9						2	18
SA36 Battalion	6						2	12
TOTAL								**154–55**

Source: Author's calculations.

Under the Strategic Arms Reduction Treaty (START), it was reported that the maximum deliverable capacity of Russian ICBMs in Ukraine was 1,240 warheads.[4] However, two Russian sources contend that there were actually between 1,272 and 1,280 warheads stationed in Ukraine for these ICBMs.[5] Such a small number of excess warheads, stationed with the ICBMs in Ukraine, is too small to be a strategic reserve of warheads, but could well be spares. If one recalls that a strategic warhead may be just as unreliable as a non-

strategic warhead, it is possible that this excess (representing *one-thirtieth of the number of operationally assigned warheads*) could represent *a standard assignment of spares for all warheads not undergoing refurbishment or awaiting dismantlement*.

Warheads Undergoing Refurbishment

A final element of Russia's reserve stockpile is created by the specific composition of Russian non-strategic nuclear warheads. As the fissile materials and explosives which make up Russian warheads degrade, each warhead will need to be periodically refurbished to maintain its reliability. Warheads undergoing refurbishment, which are transferred out of military custody, and warheads awaiting refurbishment, are held at the fourth and lowest level of readiness. As this degradation occurs in a predictable manner, the number of warheads that would need refurbishment at any given time would be fairly well understood. As such, Russia's reserves include an additional number of warheads to keep the number of available warheads constant while warheads are serviced. As above, this is presumably not an arbitrary number of warheads, but rather a carefully designed proportion of Russia's wider stockpile.

A statement by the former Russian Deputy Minister for Atomic Energy and Industry Viktor Mikhailov suggests that approximately 15 to 20 per cent of Russia's overall non-strategic stockpile is undergoing refurbishment at any one time. Commenting on an estimate of the overall size of the Soviet Union's stockpile in an interview with the *Washington Post*, Mikhailov noted that their estimate should be increased by 15–20 per cent.[6] It is highly unlike Soviet-trained officials such as Mikhailov to comment on issues that are outside of their immediate portfolio. In this case, the entirety of Russia's non-strategic nuclear stockpile was outside his portfolio, *except for warheads undergoing refurbishment,* which is carried out by the Ministry for Atomic Energy and Industry. It is possible, therefore, that in referring to an increase of 15–20 per cent, Mikhailov was indirectly referring to this final portion of Russia's overall non-strategic nuclear stockpile. If this is indeed representative of a relatively constant refurbishment schedule, it is possible to characterise this element of Russia's non-strategic reserves as equivalent to *one-fifth of the number of all other warheads not awaiting dismantlement.*

Notes and References

1. Or in Russian: СГ-1, СГ-2, СГ-3 and СГ-4.

2. It is important to note that the text of this statement, as published within *Pravda*, makes no mention of this Scud-specific collection of warheads. '9К72 / R-17 - SS-1C/D/E SCUD-B/C/D' (in Russian), *militaryrussia.ru*, <http://militaryrussia.ru/blog/topic-200.html>, accessed 31 October 2012.

3. These spares are not distributed *in addition* to operationally assigned warheads, and as such make no net difference to the number of warheads that can be delivered in a first wave of strikes.

4. J F Dunn, 'The Ukrainian Nuclear Weapons Debate', SSRC Occasional Brief No. 18, April 1993, <http://www.fas.org/news/ukraine/occbrf18jfd.htm>, accessed 31 October 2012.

5. S Goncharov, 'Adventures of Subsonic Cruise Missiles' (in Russian), in *Nezavisimoe voennoe obozrenie* (*Independent Military Review*), 23 December 2011, <http://nvo.ng.ru/armament/2011-12-23/12_rockets.html>, accessed 31 October 2012; A Dokuchaev, 'Golden Trident's Power' (in Russian), *Krasnaya zvezda*, 13 January 1993, p .2.

6. ITAR-TASS, RIA material, *Komsomol'skaya Pravda*, 6 February 1992.

VIII. Conclusion

WHEN the estimated numbers of operationally assigned warheads for each military service branch are collated, a picture emerges that differs dramatically from commonly accepted estimates. This study suggests that rather than maintaining approximately 2,000 non-strategic nuclear warheads assigned to nuclear-capable delivery vehicles,[1] Russia currently assigns between 860 and 1,040 warheads, about half of the accepted estimate. A comprehensive table detailing both Russia's nuclear-capable forces and the warheads assigned to them can be found in Appendix 1.

Table 1: A New Estimate of Russia's Operationally Assigned NSNW Warheads.

	Warheads in				
Armed Service	**Western Russia**	**Southern Russia**	**Central Russia**	**Eastern Russia**	**Total Operationally Assigned Warheads**
Ground Forces	48–80	20–30	24–36	36–64	128–210
Naval Forces	175	20	0	135	330
Air Forces	210	36	52	36	334
Air-Defence Forces	68–128	0–6	0–15	0–17	68–166
TOTAL					**860–1,040**

Source: Author's calculations.

The methodology employed to reach this conclusion is based primarily upon publicly available information and always upon explicitly stated assumptions on the part of the Russian armed forces. Furthermore, by reaching further into historical information, this study has also been able to postulate standards by which Russia sets aside spare warheads to replace any faulty operationally assigned warheads, and by which Russia maintains a strategic 'reserve' of warheads not scheduled for dismantlement (see Chapter VII). These standards suggest, that including its operationally assigned stockpile of 860–1,040 warheads, Russia currently maintains an *overall* stockpile of approximately 1,900 non-strategic nuclear warheads not scheduled for dismantlement.

Finally, this methodology has been applied retrospectively to check the internal consistency of its estimates against the most trusted statements regarding Russia's non-strategic nuclear warhead stockpile (see Appendix 2). This retrospective check produces estimates of Russia's overall stockpiles of 1988, 1991 and 2005 that vary from official and semi-official statements regarding Russia's non-strategic nuclear stockpile by insignificant margins. Interestingly, the retrospective estimate of Russia's overall non-strategic nuclear stockpile in 1991 coincides almost perfectly with an estimate made by the now-renamed US State Department Arms Control and Disarmament Agency (ACDA) in the same year. It is possible, therefore, that the US ACDA

used a similar methodology to that employed here in order to produce its estimate.

If this is the case, official US bodies may be aware that the currently accepted estimates (which portray a large discrepancy between US and Russian stockpiles) are far from perfect.[2] Indeed, depending on one's definition of 'defensive' weapons, there are only between 439–471 non-strategic 'non-defensive' nuclear weapons in western Russia.[3] This number of strictly 'offensive' weapons is not dramatically larger than the 180–200 US non-strategic nuclear weapons (and fifty French warheads not deployed on strategic submarines) operationally deployed in Europe. Importantly, Russian policy-makers may be similarly aware of such quietly held US scepticism regarding the estimates that form the basis of its non-strategic arms-control policy. Pursuing an arms-control agenda inspired by a suspect estimate of Russia's baseline level of armaments could at best be seen as purely a propaganda exercise, and at worst a deliberate attempt to undermine Russia's security. As diplomacy is a game of perceptions, it is vital that the US (and NATO) is seen to pursue a non-strategic arms-control agenda informed by transparent and malleable estimates of Russia's baseline forces. The US and NATO can only alter Russia's currently sceptical approach to non-strategic nuclear arms control through action, rather than words.

Current Western approaches to non-strategic nuclear arms control with Russia can be described as 'unempathetic', in that they do not consider Russia's sincere concerns and threat perceptions, and its diverse and geographically dispersed non-strategic nuclear arsenal. For instance, persistently comparing the entirety of Russia's non-strategic nuclear stockpile to just US warheads based in Europe misrepresents Russia's current non-strategic nuclear policy,[4] and does not encourage Russia's active participation in arms-control negotiations. After all, it makes no difference to Russia if the nuclear bomb that destroys Moscow is delivered as a result of a multilateral decision from Brussels, or an independent decision from Paris. Given Russia's serious conventional military inferiority, and (as this paper suggests) only marginal advantage in the number of deployed assigned non-strategic nuclear weapons near its border with Europe, it should not be so challenging to map a productive path through the Kremlin's current security concerns.

One of the fundamental assumptions on which this new estimate is built must be remembered: the size and structure of Russia's non-strategic nuclear-warhead stockpile is determined by the number of tasks assigned to Russia's armed forces. Asking Russia to reduce its non-strategic nuclear weapons (and therefore abandoning some of the nuclear tasks that these weapons fulfil) without addressing the security concerns that create these tasks would inevitably undermine Russia's perceived security. However, creating the conditions in which Russia might re-assess its security threats

could prompt them to abandon some of these non-strategic nuclear tasks. However, little attempt has been made to bring about these conditions, and, as such, Russia is highly unlikely to share the West's enthusiasm for non-strategic nuclear reductions.

Pursuing an arms-control policy preconditioned on Russian 'reciprocity' (which is understandably translated as 'unilateral cuts'), when it is clear that this pursuit is designed to serve NATO's own desire for reductions, is actually counterproductive. Given the importance placed on non-strategic nuclear arms control by the US and within NATO's Deterrence and Defence Posture Review, the possibility that Russia's non-strategic nuclear arsenals have been greatly exaggerated should be seriously considered. If the US and NATO sincerely wish to negotiate non-strategic nuclear reductions with Russia, they should abandon rhetoric that seeks to paint the issue of non-strategic nuclear arms control in the context of Russia's 'huge supremacy', acknowledge the diverse elements and geographically dispersed tasks of Russia's stockpile, and consider what they (and France) could offer to prompt Russia to reassess its nuclear needs.

Notes and References

1. See Hans M Kristensen and Robert S Norris, 'Nonstrategic Nuclear Weapons, 2012', *Bulletin of the Atomic Scientists* (Vol. 68, No. 5, 2012); Shannon N Kile et al., 'World Nuclear Forces', *SIPRI Yearbook 2012* (Oxford: Oxford University Press, 2012).

2. The US Secretary of Defense Robert Gates stated in 2010 that the Russian NSNW forces 'outnumber ours [those of the US], thousands to one... in the [sic] western Russia'. Secretary Gates might well be right had he actually been referring to the number of *US* nuclear weapons based in western Russia – that is, *on Russian soil* – but that would mean a *very* uneasy question for the Russian government itself. See 'The New Start Treaty', Docs. 111–5: Hearings Before the Committee on Foreign Relations, United States Senate, 111th Congress, Second Session, 2010, <http://www.gpo.gov/fdsys/pkg/CHRG-111shrg62467/pdf/CHRG-111shrg62467.pdf>, accessed 31 October 2012.

3. The US traditionally excludes warheads for air defence, ballistic-missile defence and coastal defence from its count of strike nuclear warheads. This rule is also used in this study.

4. Bruno Tertrais, 'The Sky Would Not Fall, but it Might Get a Little Darker: A French Perspective', in Malcom Chalmers (ed), 'If the Bombs Go: European Perspectives on NATO's Nuclear Debate', *RUSI Whitehall Report* 1-11 (May 2011), pp. 11, 18

About the Author

Dr Igor Sutyagin is a research fellow in Russian studies at the Royal United Services Institute. His research is concerned with Russian foreign policy, domestic politics, developments in strategic armament and nuclear arms control, anti-ballistic missile defence systems and policy, and the Russian armed forces.

Prior to joining RUSI, Dr Sutyagin worked on American and Canadian studies at the Russian Academy of Science as head of section in the Political-Military Studies Department. He participated as an off-site expert for the Soviet delegation at the Conventional Forces in Europe talks; worked extensively on US and Russian naval development programmes and US-Russian naval co-operation; US nuclear arsenal modernization; and US and Russian strategic armament and ballistic missile defence issues. He has authored over 120 articles and booklets published in the Soviet Union/Russia, United States, United Kingdom, Germany and Switzerland, including more than twenty-five articles in the specialist magazines of the Russian General Staff, Main Naval Staff, and the Ministry of Defence, and a number of articles and booklets published by the Center for Naval Analyses in the USA. He is also a co-author of *Russian Strategic Nuclear Weapons* (Moscow: IzdAT, 1998).

Dr Sutyagin has a PhD in Contemporary History from the Institute for US and Canadian Studies in Moscow and a Master's degree in radio physics and electronics from Moscow State University. He is also a graduate of the College of International and Security Studies at the George C Marshall European Center for Security Studies. Dr Sutyagin has previously held fellowships at the King's College, London and Stanford University.

Appendix 1: Cumulative Table

Delivery Means	Western		Southern		Central		Eastern		Total Assigned Warheads
	Delivery Vehicles	Assigned Warheads	Delivery Vehicles	Assigned Warheads	Delivery Vehicles	Assigned Warheads	Delivery Vehicles	Assigned Warheads	
Air-Space Defence Troops									
A-135M BMD system	68	68							68
SA-10/20	52 battalions (416 launchers)	0-52	6 battalions (48 launchers)	0-6	15 battalions (120 launchers)	0-15	14 battalions (112 launchers)	0-14	0-87
SA-21	8 battalions (64 launchers)	0-8					3 battalions (24 launchers)	0-3	0-11
TOTAL		**68-128**		**0-6**		**0-15**		**0-17**	**68-166**
Air Force[b]									
Backfire	3 regiments (71 aircraft)	102			1 regiment (33 aircraft)	34			136
Fencer-D[a]	4 regiments (89 aircraft)	72	2 regiments (58 aircraft)	36	1 regiment (24 aircraft)	18	2 regiments (48 aircraft)	36	162
Fullback	1 regiment (12 aircraft)	18	5 aircraft0						18
Foxbat-D/F	1 regiment (15 aircraft)	18							18
TOTAL		**210**		**36**		**52**		**36**	**334**
Navy									
SLCM	8 subs	56					5 subs	40	96
ASM	13 ships/subs	21	6 ships	7			9 ships/subs	16	44
Surface-based NDB	12 ships	19	3 ships	3			6 ships	6	28
Surface-based air defence	2 ships	3	1 ship	1			1 ship	1	5
Surface ASW missiles	8 ships	8	3 ships	3			4 ships	4	15
Submarine ASW missiles/torpedo	21 subs	42					17 subs	34	76
Shore-based aviation NDB	20 aircraft20	4	aircraft	4			22 aircraft22	46	
Coastal defence missiles	3 battalions	6	1 battalion	2			6 battalions	12	20
TOTAL		**175**		**20**				**135**	**330**
Ground Troops									
Short-range ballistic missiles	4 brigades (48 launchers)	48–72	1 brigade, 2 independent battalions (20 launchers)	20–30	2 brigades (24 launchers)	24–36	3 brigades (36 launchers)	36–54	128–192
Nuclear artillery[c]	4 battalions (72 AS)	0–8					5 battalions (90 AS)	0–10	0–18
TOTAL		**48-80**		**20–30**		**24–36**		**36–64**	**128–210**
Grand total		**501–593**		**76–92**		**76-103**		**207-252**	**860–1,040**

(a) It is considered that one Fencer-D regimental equivalent deployed at Gvardeyskoy (Crimea) on Ukrainian soil is fully de-nuclearised, and as such there are no nuclear warheads assigned to it.
(b) Five Fullbacks and four Fencer-Ds are currently deployed at the 929th Flight Test Centre (Combat Training and Conversion test range) in Akhtubinsk to serve the flight test and crew combat conversion programmes. These will be transferred back to their 'mother' unit at times of hostility. It is assumed that given the 'temporary' status of such a deployment, their corresponding warheads are assigned to their 'mother' units – and they are counted as such.
(c) AS=Artillery Systems

Appendix 2: A Retrospective Test

It is an important axiom of research that any study should stand up to historical scrutiny and be able to accommodate new information. This study is no exception; but in the absence of new information, it is therefore worth checking that the methodology employed in this estimate can be applied to historical data regarding the size and distribution of Soviet/Russian forces, and that it produces an estimate which conforms to what little official or semi-official information is historically available on Russia's stockpile.

To do so, this retrospective test of the methodology collects information regarding the size and distribution of Russia's military forces during a selection of years. In particular, the International Institute for Strategic Studies' *The Military Balance* is drawn upon heavily as a consistent indicator of the Soviet Union's/Russia's military forces over a number of decades.[1] Information presented in Chapters III–VI can then be drawn upon to identify which of these forces maintained a nuclear role at particular times, and how many non-strategic nuclear warheads might have been assigned to them.[2]

To expand this retrospective estimate of operationally assigned warheads to an estimation of the entire non-strategic nuclear stockpile, it is necessary to rely on the approximate standards for reserve warheads discussed in Chapter VII. These reserve warheads would include any warheads assigned to temporarily unavailable forces, a number of 'strategic reserve' warheads, a small number of spare warheads, and a number of warheads undergoing refurbishment.

History presents three interesting opportunities to assess the accuracy of such retrospective estimates against official or semi-official information about Russia's total non-strategic nuclear stockpile. The production of retrospective estimates for these dates is detailed in Tables 16 and 17 in this appendix.

The Soviet Non-Strategic Nuclear Stockpile at the End of the 1980s
While the Soviet Union's (and now Russia's) tradition of secrecy prevents the release of official information regarding the absolute size of its NSNW stockpile, the USSR's dissolution created the opportunity for Soviet successor states, Ukraine in particular, to be more forthcoming with Soviet-era secrets.

For a brief period after the dissolution of the USSR, Ukraine inherited the third-largest nuclear stockpile in the world, alongside all of the Soviet military planning documents and personnel from the two of four Soviet Operational Commands (those orientated against NATO) located in its territory. As such, when it became independent, Ukraine possessed a significant amount of sensitive information relating to the former Soviet Union's non-strategic nuclear stockpile. The National Institute for Strategic Studies (NISS) of

Ukraine, established by Ukrainian presidential decree and subordinate to the president,[3] disclosed in a 1999 report that as the Warsaw Pact dissolved towards the end of the 1980s, the Soviet Union's armed forces possessed 18,020 non-strategic nuclear warheads.[4] Given its direct subordination to the Ukrainian president, and its responsibility to support the president's national security strategy, it is hard to imagine the NISS not drawing upon all information available, including inherited Soviet documents, to come to this conclusion. As such, this report is as close to an estimate of the Soviet Union's non-strategic stockpile at the end of the 1980s as the available information allows.

Recalling that warheads undergoing refurbishment are transferred out of the custody of the military, this estimate represents only part of the Soviet Union's entire stockpile. Revising this figure up by a fifth (as described in Chapter IX) to include warheads undergoing refurbishment suggests at the end of the 1980s the Soviet Union's overall stockpile comprised approximately 21,600 warheads. While no specific date is attached to this figure, for the purposes of this retrospective test, it is reasonable to assume that the 'end of the 1980s' can be interpreted as between 1988 and 1989. With this in mind, a retrospective application of this methodology estimates that the Soviet Union's overall stockpile between 1988 and 1989 contained between 20,100 and 20,600 warheads. This retrospective stockpile estimate varies from the NISS-derived estimate (around 21,600 warheads) by only 4.7 and 7 per cent respectively.

Russia's NSNW Stockpile between 1991 and 2005

As discussed above, in 1991 and 1992 Russia committed itself to a series of unilateral reductions to its non-strategic nuclear warhead arsenal. More than a decade later, Russian Deputy Foreign Minister Sergey Kislyak announced in 2005 that Russia had reduced its non-strategic nuclear stockpile 75 per cent since 1991, in fulfilment of these promises.[5]

As one of the rare occasions on which Russia gave officially sanctioned information regarding its non-strategic nuclear-warhead stockpile, many estimates have relied heavily upon this statement. In some cases, it is possible that this statement forms the primary influence on existing estimates of Russia's overall non-strategic stockpile.[6] As such, it is reasonable to think that the statement referring to a 75 per cent stockpile reduction between 1991 and 2005 is as close to a fact as can be hoped for when investigating Russia's NSNW.

A retrospective estimate of Russia's overall non-strategic nuclear stockpile for 1991 suggests that Russia may have had approximately 7,900 operationally assigned non-strategic nuclear warheads.[7] When one considers the standards for reserve warheads postulated in Chapter IX, this equates to an overall stockpile of approximately 13,000 warheads.[8] If Russia's 2005 statement regarding the 75 per cent reduction in its non-strategic nuclear stockpile is assumed to be true, by 2005 this estimated stockpile of approximately 13,000

warheads should have been reduced to approximately 3,250 warheads. When a retrospective estimate of Russia's non-strategic stockpile for 2005 is carried out using the methodology set out in this paper, it suggests that Russia maintained approximately 2,000 operationally assigned warheads at this time. This equates approximately to an *overall stockpile* of 3,200 warheads; a difference of only 1.5 per cent from the expected value.

Looking Back at Russia's NSNW Stockpile

These retrospective checks paint an encouraging picture for the methodology used in this paper. First, they produce an estimate that is consistent with official statements regarding reductions in Russia's overall stockpile. Secondly, it also produces an estimate that correlates well with semi-official statements regarding the absolute size of the Soviet Union's stockpile in 1988. While this is not conclusive proof that this estimates is correct (this could only happen if Russian transparency makes such *estimates* redundant), its correlation with two independent data points suggests it may at least be relatively accurate.[9]

Finally, and perhaps most importantly, this retrospective estimate suggests that Russia's arsenal of non-strategic nuclear weapons has declined significantly since 1988. Its current overall stockpile may have reduced by 50 per cent over the last seven years, and could be only one-tenth of its size in 1988. This downward trend is the mirror-image of suspected US reductions over the same period: it is estimated that the US stockpile of non-strategic nuclear weapons has fallen from 7,600 in 1991 to 760 today.[10]

Table 15: The Downward Trend in Russia's NSNW Stockpile.

Year	Estimate of Operationally Assigned Warheads	Estimate of Overall Stockpile
1988	≈12,500	≈20,400
1991	≈7,900	≈13,000
2005	≈2,000	≈3,200
2012	≈1,000	≈2,000

Notes and References

1. *The Military Balance* presents information on the absolute number of systems, rather than the number of units these systems represent. This retrospective test therefore translates the number of individual systems into the corresponding number of units.

2. The production of these retrospective estimates is complicated by the suspected existence of nuclear demolition and sabotage munitions, which are not associated with any delivery vehicle. Therefore their numbers cannot be inferred so simply. Newspaper stories from the 1990s and 2000s suggest that the Soviet Union once held between 200 and 500 sabotage or demolition munitions. According to a member of the Russian

Academy of Sciences quoted in the same newspapers, up to 700 such munitions could have been produced. As such, a grand total of 700 demolition or sabotage munitions (including all spares and reserves) are assumed in 1988 and 1991. See Andrey Baranov, 'Hundreds of Hiroshimas Walking in Russia in Rucksacks?' (in Russian), *Komsomolskaya Pravda,* 9 September 1997, p. 5; Pavel Felgengauer, 'Lebed Renounced Nuclear Briefcases' (in Russian), *Segodnya*, 7 October 1997, p. 2; Viktor Sokirko, 'Academic Yablokov Sat on the Nuclear "Barrel"' (in Russian), *Komsomolskaya pravda*, 12 November 1997, p. 1.

3. The National Institute for Strategic Studies of Ukraine is the Ukrainian presidential administration's analytical centre, established in 1992. It has been directly subordinate to the president of Ukraine since 2002 (see Presidential Decree No. 1158/2002 of 16 December 2002). On NISS responsibilities, see the Institute's official website (in Russian), <http://ru.niss.gov.ua/> , accessed on 23 October 2012.

4. According to the NISS report, these warheads were distributed in the following manner: 12,320 in the Russian Federation, 2,345 in Ukraine, 1,180 in Belarus, 330 in Kazakhstan, 325 in Lithuania, 320 in Georgia, 270 in Estonia, 200 in Armenia, 185 in Latvia, 125 in Turkmenistan, 105 in Uzbekistan, ninety in Moldova, seventy-five in Azerbaijan, seventy-five in Tajikistan and seventy-five in Kyrgyzstan. See A Shevtsov, A Izhak, A Gavrish and A Chumakov, 'Tactical Nuclear Weapons in Europe' (in Ukrainian), National Institute for Strategic Studies, Dnepropetrovsk, 1999, p. 8, <http://www.db.niss.gov.ua/docs/polmil/51.pdf >, accessed 13 October 2012.

5. Hans M Kristensen, 'Non-Strategic Nuclear Weapons', Special Report No. 3, *Federation of American Scientists*, May 2012, p. 49, <http://www.fas.org/_docs/Non_Strategic_Nuclear_Weapons.pdf>, accessed 31 October 2012.

6. Shannon N Kile et al., 'World Nuclear Forces, 2012', *SIPRI Yearbook 2012* (Oxford: Oxford University Press, Oxford), p. 334.

7. Including those assigned to temporarily unavailable forces.

8. It is interesting to note that this estimate aligns exactly with that made by the now-renamed US Arms Control and Disarmament Agency in the same year, which suggested that the Soviet stockpile contained at least 13,000 non-strategic nuclear warheads. This is by no means conclusive proof that this retrospective estimate is correct, but this coincidence between independent estimates *could* reflect an accurate estimate of Russia's 1991 stockpile. See Kristensen, 'Non-Strategic Nuclear Weapons', Fig. 12, 'Estimated Russian Non-Strategic Nuclear Weapons, 1991–2012', p. 50.

9. If one also considers the alignment of the retrospective estimate of 1991 with the US Arms Control and Disarmament Agency estimate of the same year (see note 8), these retrospective estimates correlate with *three* independent data points.

10. Kristensen, 'Non-Strategic Nuclear Weapons', p. 14.

Table 16: Retrospective Cumulative Table.

Weapon System	Warheads Assigned per Unit	1988			1991			2005			Sources
		Number of Systems/Number of Units	Assigned Warheads	Total Assigned Warheads	Number of Systems/Number of Units	Assigned Warheads	Total Assigned Warheads	Number of Systems/Number of Units	Assigned Warheads	Total Assigned Warheads	
Intermediate-Range Rocket Forces											
SS-4	12 per regiment	72/9 regiments	108	2502	0	0	0	0	0	0	[MB]
SS-20	42 per regiment[a]	509/57 regiments	2394								[MB]
Ground Troops											
SS-1c	18 per brigade	630/53 brigades	954		550/46 brigades	828		3 brigades[b]	54		[MB]
SS-22	18 per brigade	132/11 brigades	198		0	0		0	0		[MB]
SS-23	18 per brigade	106/9 brigades	162		0	0		0	0		[MB]
FROG-7	4 per battalion	650/163 indep.bn	652		500/125 indep.bn	500		0	0		[MB]
SS-21	4 per battalion	140/35 indep.bn	140		300/75 indep.bn	300		14 brigades[b]	252		[MB]
M-1976 (2A36)	2 per battalion	1500/63 battalions[c]	126	2658 - 3158	574/24 battalions	48	1950-2450	1100/61 battalions	122	600	[MB]
2S5	2 per battalion	2100/88 battalions	176		494/21 battalions	42		950/53 battalions	106		[MB]
2S7	2 per battalion	200/8 battalions	16		304/13 battalions	26		130/7 battalions	14		[MB]
B-4M	2 per battalion	0	0		0	0		40/2 battalions	4		[MB]
2S4	2 per battalion	400/17 battalions	34		54/3 battalions	6		430/24 battalions	48		[MB]
Nuclear Mines		200 - 700[d]			200 - 700[d]			0			
Nuclear sharing[e]											
GDR											
SS-23	12 per brigade	18/2 brigades	24								[1], [2]
SS-21	6 per battalion	4/1 indep.battalion[g]	24	124	0	0	0	0	0	0	[MB]
SS-1b[f]	18 per brigade	24/2 brigades	36								[MB]
FROG-7(h)	4 per battalion	40/10 indep.battalions	40								[MB]
ČSSR											
SS-23	18 per brigade	10/1brigade	18								[1], [2]
SS-1b	12 per brigade	27/3 brigades	36	94	0	0	0	0	0	0	[MB]
FROG/SS-21	4 per battalion	40/10 indep.battalions	40								[MB]
Poland											
SS-1b	12 per brigade	32/4 brigades	48	104	0	0	0	0	0	0	[MB]
FROG	4 per battalion	56/14 indep.battalions	56								[MB]
Bulgaria											
SS-23	12 per brigade	8/1 brigade	12								[1], [2]
SS-1c	18 per brigade	48/4 brigades	72	136	0	0	0	0	0	0	[MB]
FROG-7	4 per battalion	40/13 indep.battalions	52								[MB]
Romania											
SS-23	12 per brigade	8/1 brigade	12								[2]
SS-1b	12 per brigade	18/2 brigades	24	76	0	0	0	0	0	0	[MB]
FROG-5	4 per battalion	30/10 indep.battalions	40								[MB]
Hungary											
SS-1b	12 per brigade	9/1 brigade	12	36	0	0	0	0	0	0	[MB]
FROG-7	4 per battalion	24/6 indep.battalions	24								[MB]
National Air Defence Troops											
Missile defence											
Gorgon	1 per missile	32	32	100	32	32	100	32	32	100	[MB]
Gazelle	1 per missile	68	68		68	68		68	68		[MB]
Air defence											
SA-1	6 per regiment	1620/27 regiments	162		1600/26 regiments	156		0	0		[MB]
SA-2	3 per battalion	2500/417 battalions	1251	1852	2400/400 battalions	1200	1823	0	0	198	[MB]
SA-5	1 per battalion	1930/322 battalions	322		1950/325 battalions	325		0	0		[MB]
SA-10/20	1 per battalion	1400 quad/117 bn	117		1700 quad/142 bn	142		1900 quad/198 bn[j]	198		[MB]
Air Force											
Long Range Aviation											
Badger[k]	34	272/11 regiments	374		120/5 regiments	170		0	0		[MB]
Blinder[k]	34	120/5 regiments	170	896	100/4 regiments	136	578	0	0	170	[MB]
Backfire[k]	34	178/8 regiments	272		190/8 regiments	272		124/5 regiments	170		[MB]
SSC-4	1 per missile	80	80		0	0		0	0		[MB]
Frontal Aviation [l]											
Fishber-L	18 per regiment	135/4 regiments	72		0	0		0	0		[MB]
Flogger-B/D/G/J	18 per regiment	885/28 regiments	504		610/19 regiments	342		0	0		[MB]
Foxbat-B/D/F	18 per regiment	120/4 regiments	72	1548	240/8 regiments	144	1134	18/1 regiment	18	360	[MB]
Fitter-C/D/H	18 per regiment	810/25 regiments	450		330/10 regiments	180		0	0		[MB]
Fencer	18 per regiment	810/25 regiments	450		840/26 regiments	468		451/19 regiments	342		[MB]
Navy											
See Table 18		2173			2073			537			
TOTAL ASSIGNED WARHEADS		**12,299 - 12,799**			**7,658 - 8,158**			**1,965**			
TOTAL NSNW STOCKPILE		**20,158 - 20,658**			**12,516 - 13,016**			**3245**			

Sources

[MB] IISS, *The Military Balance* (1988-89, 1991-92, 2005-06).

[1] Bronislav Omelichev (First Deputy Chief of the Soviet Armed Forces General Staff), 'We Carry Out Honest and Principled Policy' (in Russian), *Krasnaya Zvezda*, 16 February 1991.

[2] 'Oka Operational-Tactical Missile System' (in Russian), armyman.info, <http://armyman.info/rakety/raketnye-kompleksy-obschego-naznacheniya/2906-operativno-takticheskij-raketnyj-kompleks-9k714-171oka187.html >

Table 17: Retrospective Cumulative Table (Soviet/Russian Navy).

Platform	Warheads Assigned per Unit									1988		1991		2005	
	Non-strategic ballistic missiles	Anti-Ship Missiles	Cruise Missiles	Bombs	Depth Bombs	Air Defence	Anti-Submarine Missiles	Sub-launched Anti-Submarine Missiles/Torpedos	NAP	Number of Units (+ temporarily unavailable)	Number of Warheads	Number of Units (+ temporarily unavailable)	Number of Warheads	Number of Units (+ temporarily unavailable)	Number of Warheads
Submarines															
Typhoon SSBN								2		5	10	6	12	2 + 1	6
Delta-IV SSBN								2		4	8	7	14	3 + 3	12
Delta-III SSBN								2		14	28	14	28	6	12
Delta-II SSBN								2		4	8	4	8	0	0
Delta-I SSBN								2		18	36	18	36	0	0
Yankee-II SSBN								2		1	2	0	0	0	0
Yankee-I SSBN								2		16	32	11	22	0	0
Hotel SSBN								2		1	2	0	0	0	0
Golf SSB	3							2		12	60	0	0	0	0
Oscar SSGN		3						2		4	20	8	40	7 + 1	40
Yankee Notch SSGN			32					2		2	68	2	68	0	0
Yankee SS-NX-24 test-bed								2		0	0	1	2	0	0
Papa SSGN		2						2		1	4	0	0	0	0
Charlie-II SSGN		2						2		6	24	6	24	0	0
Charlie-I SSGN		2						2		10	40	9	36	0	0
Echo-II SSGN		2						2		27	108	18	72	0	0
Julliet SSG		1						2		16	48	15	45	0	0
Akula SSN			8					2		3	30	7	70	8 + 2	100
Sierra-II SSN			8					2		0	0	1	10	1 + 1	20
Sierra-I SSN								2		2	4	2	4	1	2
Mike SSN			4					2		1	6	0	0	0	0
Alfa SSN								2		5	10	6	12	0	0
Victor-III SSN			4					2		22	132	25	150	4 + 1	30
Victor-I, II SSN								2		23	46	23	46	0	0
Yankee ex-SSBN								2		15	30	1	2	0	0
Hotel ex-SSBN								2		3	6	0	0	0	0
Echo-II ex-SSGN								2		1	2	0	0	0	0
November SSN								2		12	24	0	0	0	0
Echo-I SSN								2		5	10	0	0	0	0
Kilo SS								2		11	22	18	36	14 + 5	38
Tango SS								2		18	36	18	36	0	0
Foxtrot SS								2		42 + 10	104	38 + 10	96	0	0
Zulu SS								2		4 + 2	12	1	2	0	0
Romeo SS								2		4	8	0	0	0	0
Whiskey SS								2		45 + 60	210	20+10	60	0	0
Hotel SSQN								2		1	2	0	0	0	0
Golf SSQ								2		0	0	2	4	0	0
TOTAL ASSIGNED WARHEADS										1192		935		260	
Surface combatants															
Kuznetsov CVG[m]		2			8					0	0	1	10	1	10
Baku CVG		2		18	8					1	28	1	28	0	0
Kiev CVG		1		18	8		16[n]			3	129	3	129	0	0
Moskva CGH					8		8[n]			2	32	2	32	0	0
Kirov CGN		3			1	2	1			2	14	3	21	2	14
Slava CG		2			1	1				2	8	3	12	3	12
Kara CG					1		1			7	14	7	14	1	2
Kresta-II CG					1		1			10	20	10	20	0	0
Kresta-I CG		1			1					4	8	2	4	0	0
Kynda CG		4			1					4	20	2	10	0	0
Sverdlov light cruiser									4[l]	5 + 4	36	0	0	0	0
Sovremenny DDG		1			1					8	16	13	26	6	12
Udaloy DDG					1		1			10	20	11	22	7	14
Udaloy-II DDG					1		1			0	0	0	0	1	2
Kashin Mod. DDG		1			1					5	10	3	6	1	2
Kashin DDG					1					13	13	10	10	0	0
Kildin Mod.DDG		1								3	3	1	1	0	0
Krivak-I/II FFG							1			32	32	32	32	5	5
Neustrashimiy FFG					1		1			0	0	0	0	1	2
Nanuchka		1								39	39	36	36	13	13
TOTAL ASSIGNED WARHEADS										442		413		88	

Continued overleaf.

Table 18 (cont.): Retrospective Cumulative Table (Soviet/Russian Navy).

Shore-based naval aviation								
Backfire	6		180 (7 regiments)	42	160 (7 regiments)	42	58 (2 regiments)	12
Blinder	6		40 (2 regiments)	12	6 (1 squadron)	2	0	0
Badger	6		180 (7 regiments)	42	190 (8 regiments)	48	0	0
Fitter-C/D/H/K	18		90 (3 regiments)	54	350 (11 regiments)	198	0	0
Fencer-D	18		20 (1 regiment)	18	110 (5 regiments)	90	58 (2 regiments)	36
Flogger-B	18		0	0	30 (1 regiment)	18	0	0
Bear-F		1	65	65	53	53	28	28
May		1	59	59	53	53	43	43
Mail		1	95	95	92	92	20	20
Haze-A		1	110	110	79	79	0	0
TOTAL ASSIGNED WARHEADS			497		675		139	
Coastal defence								
Redut SSC-1 mobile	2		19 battalions	38	19 battalions	38	19 battalions	38
Sopka SSC-1 fixed	2		2 battalions	4	0	0	0	0
2A36 guns		2	0	0	96 (4 battalions)	8	50 (3 battalions)	6
2S5 self-propelled guns		2	0	0	48 (2 battalions)	4	48 (3 battalions)	6
TOTAL ASSIGNED WARHEADS			42		50		50	
TOTAL ASSIGNED WARHEADS			2173		2073		537	

Notes and References to Tables 17 and 18

(a) Each SS-20 regiment consists of nine launchers, each capable of carrying three warheads. Assuming enough warheads are assigned for one-and-a-half full salvos per unit (see Chapter VI), this equates to forty-two warheads per regiment.

(b) While *The Military Balance 2005–06* (published 2005) states that Russia had fourteen SS-21 brigades, it only states that Russia had 'some' SS-1c brigades. Separately, it notes that, in total, Russia has a minimum of 200 tactical-missile launchers. If fourteen SS-21 brigades have 168 launchers between them, at a minimum, thirty-two launchers would remain. It is possible that these launchers could represent three brigades.

(c) Aside from the 2S4 mortar (which had eighteen tubes in a battalion), each Soviet artillery system contained twenty-four guns per battalion. This had changed by 2005 to eighteen guns per battalion for all artillery systems.

(d) The production of these retrospective estimates is complicated by the suspected existence of nuclear demolition and sabotage munitions. No information is available to suggest how these weapons are distributed among operationally assigned and reserve categories. As such, a grand total of between 200 and 700 demolition or sabotage munitions (including all spares and reserves) is assumed in 1988 and 1991.

(e) Contemporary sources confirm that Soviet missile forces were shared with Bulgaria, the Czechoslovakia, the East Germany, Hungary and Poland. See: Bronislav Omelichev (First Deputy Chief of the Soviet Armed Forces General Staff), 'We Carry Out Honest and Principled Policy' (in Russian), *Krasnaya Zvezda*, 16 February 1991, p. 3; *Valka.cz*, '2K6 Luna Taktický Raketový Complex' (in Czech), <http://forum.valka.cz/ftopic669.html>, accessed 1 November 2012; *Military Russia*, 'R-11/R-11M/8K11 – SS-1B SCUD-A' (in Russian).

(f) Normally, SS-1b missile brigades would consist of nine launchers. However, in this particular case, the East German military seems to have arranged twenty-four launchers into two brigades.

(g) Although warheads are typically assigned to missile brigades, this single battalion was fully independent and could operate outside of the brigade structure. As such, it is assumed here that it is assigned along normal standards, with enough warheads for one-and-a-half full salvos.

(h) Each Soviet tank and motor-rifle division had one SS-21/FROG independent missile battalion in its standard structure. The same was correct for the East European Warsaw Pact member-states' tank and motor-rifle divisions (TD and MRD) and brigades (bde). These independent battalions contained either three or four launchers. Regardless of the number of launchers within these independent battalions, it is assumed here that each are assigned four non-strategic nuclear warheads. The total assigned warheads given here is therefore based on the number of these independent missile battalions, defined by the number of soviet tank and motor-rifle divisions as defined by IISS, *The Military Balance 1988–89*.

(j) Different versions of the SA-10/20 system contained differing numbers of launchers per battalion. The early S-300PT and S-300PS systems contained twelve launchers per battalion. The newer S-300PM system, and all SA-20 and SA-21 systems, contain eight launchers in each battalion. It is assumed here that the overall number of SA-10/20 systems is split equally between the older and newer battalion structures.

(k) Soviet Air Force Long-Range Aviation was always tasked to strike major naval targets, so it is assumed that long-range regiments were assigned non-strategic nuclear weapons for these targets. See: Anatoliy Artemjev 'There are no Identical Wars' (in Russian), *Military-Industrial Courier*, <http://www.vpk-news.ru/articles/2795>, accessed 10 October 2012; 'Tu-142' (in Russian), *Sky's Corner: Aviation Encyclopaedia*, <http://www.airwar.ru/enc/sea/tu142.html>, accessed 10 October 2012.

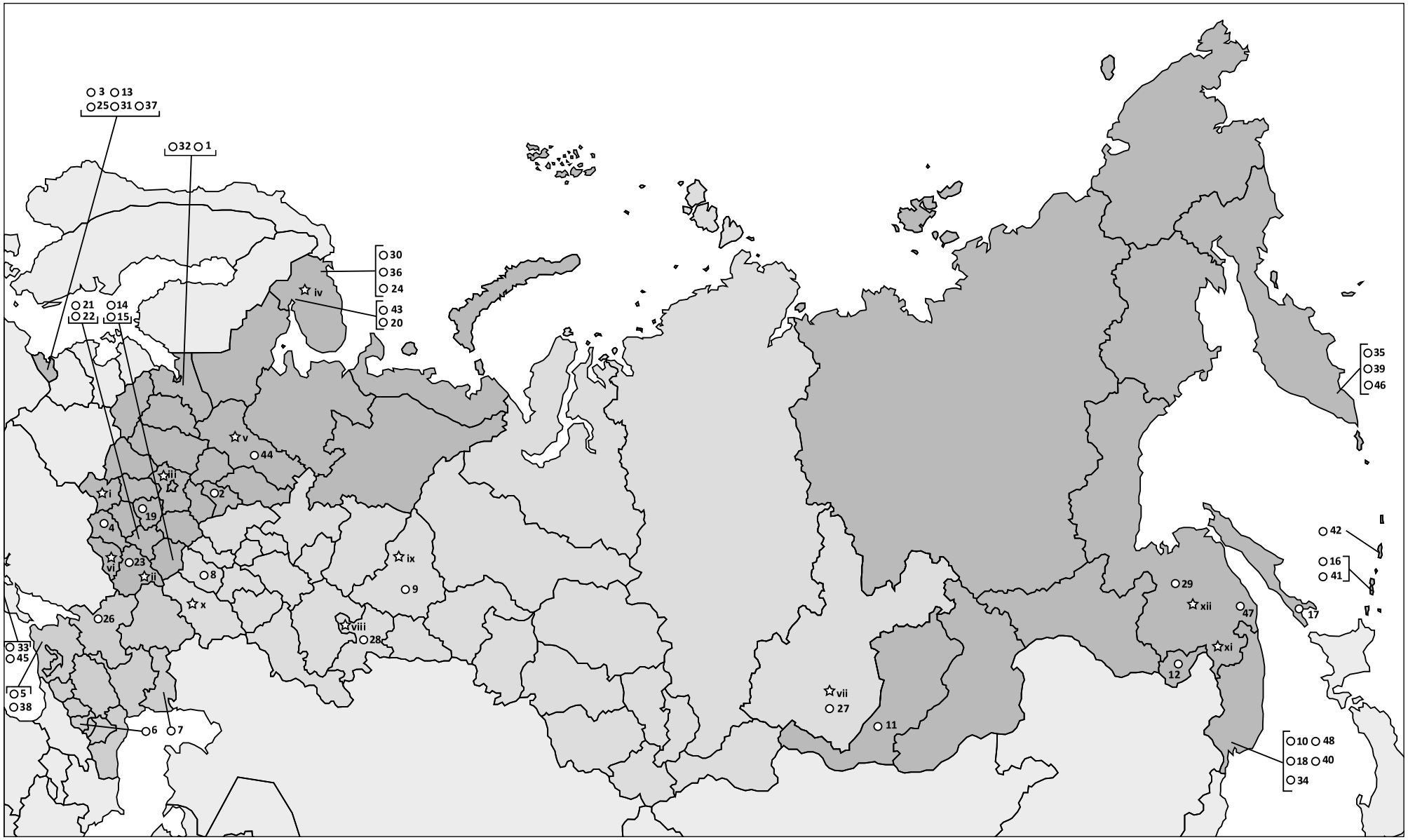
(l) Frontal Aviation regiments were comprised of thirty-two aircraft in the 1980s and early 1990s. This changed to twenty-four aircraft in the 2000s.

(m) The *Kuznetsov*-class aircraft carrier does not have fighter-bomber aircraft assigned to its air group, so it is assumed here that it does not carry air-delivered strike nuclear bombs.

(n) Both *Moskva*-class ships and three early *Kiev*-class ships carried the FRAS-1 anti-submarine warfare system, which used exclusively nuclear rockets. FRAS-1 magazines on *Moskva*-class ships could hold eight rockets, while those on the three *Kiev*-class ships could hold sixteen. The fourth *Kiev*-class ship was not equipped with the FRAS-1 system.

(o) *Sverdlov*-class light cruisers were equipped with 152-mm guns, which were armed with nuclear artillery projectiles. These guns were arranged into four turret pairs, and were formally classed as one battalion. It is assumed here that this naval-based artillery battalion is assigned NSNW in the same manner as land-based artillery battalions.

Appendix 3: The Russian NSNW Complex



Legend to Appendix 3

Label	Unit	Military District
	Nuclear Warhead storage Depots	
i	Object 365 (Bryansk-18)	West
ii	Object 387 (Voronezh-45)	West
iii	Object 714 (Mozhaysk-10)	West
iv	Object 956 (Olenegorsk-2)	West
v	Object 957 (formerly Object 360) (Vologda-20)	West
vi	Object 1150 (Belgorod-22)	West
vii	Object 644 (Irkutsk-45)	Centre
viii	Object 917 (Sverdlovsk-45)	Centre
ix	Object 943 (Zlatoust-30)	Centre
x	Object 1050 (Saratov-63)	Centre
xi	Object 1200 (Khabarovsk-47)	East
xii	Object 1201 (Komsomolsk na Amure-31)	East
	Nuclear-Certified Units	
	Missile brigades	
1	26th Missile Brigade (SS-26)	West
2	112th Guards Missile Brigade (SS-21)	West
3	152nd Guards Missile Brigade (SS-21)	West
4	448th Missile Brigade (SS-21)	West
5	1st Guards Missile Brigade (SS-21, SS-26)	South
6	4th Guards Military Base (1x SS-21 Independent Battalion)	South (South Ossetia)
7	630th Independent Missile Battalion (SS-26)	South
8	92nd Missile Brigade (SS-26)	Centre
9	119th Missile Brigade (SS-21)	Centre
10	20th Guards Missile Brigade (SS-21)	East
11	103rd Missile Brigade (SS-21)	East
12	107th Missile Brigade (SS-21)	East
	Artillery brigades	
13	244th Artillery Brigade (2A36 artillery systems)	West
14	18th Independent Self-Propelled Mortar Battalion (2S4 mortars)	West
15	19th Independent Self-Propelled Artillery Battalion (2S7 guns)	West
16	18th Machinegun-Artillery Division (2A36 guns)	East
17	39th Independent Motor-Rifle Brigade (2A36 guns)	East
18	305th Artillery Brigade (2S5 guns)	East
	Air groups	
19	6950th Air Base (Backfire)	West
20	5th Guards Air Group of 6950th Air Base (Backfire)	West
21	4th Combat Training And Conversion Centre (Fencer-D, Fullback)	West
22	968th Research-Instructor Air Regiment (Fencer-D)	West
23	7000th Guards Air Base (Fencer-D, Fullback, Foxbat)	West
24	3rd Air Group of 7000th Air Base (Fencer-D, Foxbat)	West
25	8th Guards Air Group of 7000th Air Base (Fencer-D)	West
26	4th Air Group of 6972nd Air Base (Fencer-D)	South
27	3rd Air Group of 6952nd Air Base (Backfire)	Centre
28	6980th Guards Air Base (Fencer-D)	Centre
29	6983rd Guards Air Base (Fencer-D)	East
	Navy: Seagoing vessels	
30	Ships and submarines of the Northern Fleet	West
31	Ships of the Baltiysk Naval Base, Baltic Fleet	West
32	Leningrad Naval Base, Baltic Fleet	West
33	Ships and submarines of the Black Sea Fleet	South
34	Ships and submarines of the Primorie Flotilla, Pacific Fleet	East
35	Ships and submarines of the Kamchatka Flotilla, Pacific Fleet	East
	Navy: Coastal defence	
36	536th Independent Coastal-Defence Missile Brigade	West
37	25th Independent Coastal-Defence Missile Regiment	West
38	951st Independent Coastal-Defence Missile Regiment	South
39	520th Independent Coastal-Defence Missile Brigade	East
40	72nd Independent Coastal-Defence Missile Regiment	East
41	574th Independent Coastal-Defence Missile Battalion	East
42	789th Independent Coastal-Defence Missile Battalion	East
	Navy: Fixed-wing anti-submarine aircraft	
43	7050th Air Base of Naval Aviation (May)	West
44	7051st Air Base of Naval Aviation (Bear-F)	West
45	7057th Air Base of Naval Aviation (Mail)	South
46	7060th, Air Base of Naval Aviation (May, Mail)	East
47	7061st Guards Air Base of Naval Aviation (Bear-F)	East
48	7062nd Air Base of Naval Aviation (May)	East

Air-Defence Regiments (not on map)

42nd Guards	93rd Guards	108th Guards	183rd Guards
185th Guards	210th Guards	388th Guards	500th Guards
511th Guards	531st Guards	549th Guards	568th Guards
583rd Guards	584th Guards	589th Guards	590th Guards
606th Guards	612th Guards	614th Guards	629th Guards
722nd Guards	799th Guards	890th Guards	1488th Guards
1489th Guards	1490th Guards	1528th Guards	1529th Guards
1530th Guards	1532nd Guards	1533rd Guards	1534th Guards
1536th Guards	1537th Guards	1544th Guards	1721st Guards
1724th Guards			

Disbanded Nuclear Warhead Storage Depots (not on map)

Object 980 (Krasnoyarsk-26). Disbanded 1994 after accident with 'special items'.
Object 713 (Novgorod-18)
Nalchik-20. Disbanded in 1993
Svobodniy-21
Svobodniy-18. Disbanded 1996
Kargopol-2. Disbanded 1987
Sebezh-5. Disbanded 1995
Chelyabinsk-115. Disbanded 1998
Tula-50. Disbanded 1999 after a hunger strike among civilian personnel.

Appendix 4: NATO to Russian Designations

Aerospace Defence Forces

NATO designation	Russian designation
SA-1	S-25
SA-2	S-75
SA-5	S-200
SA-10	S-300PT, S-300PS, S-300PM
SA-11	9K37M1 Buk
SA-12	S-300V
SA-20	S-300PM-1 (PMU1), S-300PM-2 (PMU2)
SA-21	S-400

Air Force

NATO designation	Russian designation
Bull	Tu-4A
Beagle	Il-28
Blinder	Tu-22
Blinder-E	Tu-22P 'Siberia-1'
Backfire	Tu-22M/M2/M3
Fencer-D	Su-24M, Su-24M2
Fencer-E	Su-24MR
Foxbat-D	MiG-25RB (RBK, RBS, RBSh)
Foxbat-F	MiG-25BM
Fitter-A	Su-7B
Fitter-C/D/H/K	Su-17M/M2/M3/M4
Flogger-D/F/H	MiG-23BM/B/BK,BN
Flogger-B	MiG-27
Fishbed-K/L	MiG-21bis
Fishbed-J	MiG-21SN
AS-4	Kh-22 and variants
AS-11	Kh-58
AS-13	Kh-59
AS-16	Kh-15 and variants
AS-18	Kh-59U
SSC-4	RK-55 Rel'ef

Navy

NATO designation	Russian designation
SA-N-3	M-11 Shtorm
SA-N-6	S-300F Fort
SA-N-20	S-300FM Fort-M
SS-N-2c	P-15M
SS-N-3	P-5, P-6, P-35
SS-N-7	P-70 Ametist
SS-N-9	P-120 Malakhit
SS-N-12	P-500 Bazalt,
	P-1000 Vulkan
SS-N-19	P-700 Granit
SS-N-21	S-10 Granat
SS-N-22	P-270 Moskit, P-105 Moskit-M
SS-N-26	P-800 Oniks
SS-N-14	URK-3 Metel (85R missiles), URK-5 Rastrub-B (85RU, 85RUS missiles
SS-N-15	RPK-2 V'yuga (81RA ASW rocket), RPK-6 Vodopad (83R, 84R missiles), RPK-6M Vodopad-NK (surface ships, 83RN, 84RN missiles)
SS-N-16	RPK-7 Veter (86R, 88R missiles)
SUW-N-1/FRAS-1	RPK-1 Vikhr (82R ASW rocket)
SSC-1B	4K44 Redut, P-10 Progress
SSC-3	4K40 Rubezh, 4K51 Rubezh
SSC-5	K-300P Bastion-P
SSC-6	3K60 Bal
Bear-F	Tu-142M
Mail	Be-12
May	Il-38
Forger	Yak-38
Hormone-A	Ka-25PL
Helix-A	Ka-27PL
Haze-A	Mi-14PL

Ground Forces

NATO designation	Russian designation
FROG-3	2K6 (3R9 rocket)
FROG-5	2K6 (3R10 rocket)
FROG-7	9K52 Luna-M
SS-1a	R-17
SS-1b, SS-1c	9K72 Elbrus
SS-4	R-12
SS-5	R-14
SS-12/22	9K76 Temp-S
SS-20	RSD-10
SS-21	9K79 Tochka, 9K79-1 Tochka-U
SS-23	9K714 Oka
SS-26	9K723 Iskander-M