

Appendix A: U.S. Nuclear Weapons in Europe, 2005

| Country | Base | Custodian ^a | Delivery Aircraft | WS3 Capacity ²³¹ | | | Weapons (B61) | | |
|----------------------|------------------|------------------------|----------------------------|-----------------------------|------------------|-----------|-----------------|-----------------|------------|
| | | | | Vaults | Capacity | Completed | U.S. | Host | Total |
| Belgium | Kleine Brogel AB | 701 MUNSS | Belgian F-16 | 11 | 44 | Apr 1992 | 0 | 20 | 20 |
| Germany ^b | Büchel AB | 702 MUNSS | German PA-200 Tornados | 11 | 44 | Aug 1990 | 0 | 20 | 20 |
| | Nörvenich AB* | | German PA-200 Tornados | 11 | 44 | Jun 1991 | 0 | 0 | 0 |
| | Ramstein AB | 52 FW | US F-16C/D | 55 ^c | 220 ^c | Jan 1992 | 90 ^d | 40 ^e | 130 |
| Greece | Araxos AB* | | | 6 | 24 | Sep 1997 | 0 | 0 | 0 |
| Italy | Aviano AB | 31 FW | US F-16 C/D | 18 | 72 | Jan 1996 | 50 | 0 | 50 |
| | Gheddi Torre AB | 704 MUNSS | Italian PA-200 Tornados | 11 | 44 | Jan 1997 | 0 | 40 | 40 |
| Netherlands | Volkel AB | 703 MUNSS | Dutch F-16 | 11 | 44 | Sep 1991 | 0 | 20 | 20 |
| Turkey | Akinci AB* | | Turkish F-16 | 6 | 24 | Oct 1997 | 0 | 0 | 0 |
| | Balikesir AB* | | Turkish F-16 | 6 | 24 | Sep 1997 | 0 | 0 | 0 |
| | Incirlik AB | 39 FW | US F-16C/D | 25 | 100 | Apr 1998 | 50 | 40 | 90 |
| United Kingdom | RAF Lakenheath | 48 FW | US F-15E | 33 | 132 | Nov 1994 | 110 | 0 | 110 |
| Total | | | | 204 | 816 | | 300 | 180 | 480 |

* Site is in caretaker status.

^a Each Munitions Support Squadron (MUNSS) includes approximately 125-150 assigned personnel.

^b Operational and support responsibilities of USAF and the Bundeswehr for munitions support bases in Germany are described in the 1960 Tool Chest Agreement.²³²

^c One vault is a training vault.

^d Assumes 20 weapons removed from Araxos Air Base in 2001 were transferred to Ramstein Air Base rather than to Aviano Air Base to avoid filling the Italian vaults to capacity. Alternatively, the weapons could have been returned to the United States.

^e Half of these weapons may have been returned to the U.S. after Memmingen Air Base closed in 2003.

Appendix B: Planned and Current WS3 Capacity²³³

| Country | Base | 1986 | | 1997 | | 2004 | |
|----------------|--------------------|------------|-------------|------------|------------|------------|------------|
| | | Vaults | Max Cap. | Vaults | Max Cap. | Vaults | Max Cap. |
| Belgium | Florennes AB | 2 | 8* | 0 | 0 | 0 | 0 |
| | Kleine Brogel AB | 11 | 44 | 11 | 44 | 11 | 44 |
| Germany | RAF Brüggen | 0 | 0 | 10 | 40 | 0 | 0 |
| | Büchel AB | 11 | 44 | 11 | 44 | 11 | 44 |
| | Hahn AB | 53 | 212 | 0 | 0 | 0 | 0 |
| | Memmingen AB | 11 | 44 | 11** | 44 | 0*** | 0 |
| | Nörvenich AB | 11 | 44 | 11** | 44 | 11** | 44 |
| | Ramstein AB | 58 | 232 | 55 | 220 | 55 | 220 |
| | Wueschheim AB | 2 | 8* | 0 | 0 | 0 | 0 |
| Greece | Araxos AB | 11 | 44 | 6 | 24 | 6** | 24 |
| Italy | Aviano AB | 18 | 72 | 18 | 72 | 18 | 72 |
| | Comiso AS | 2 | 8* | 0 | 0 | 0 | 0 |
| | Gheddi Torre AB | 6 | 24 | 11 | 44 | 11 | 44 |
| | Rimini AB | 6 | 24 | 0 | 0 | 0 | 0 |
| Netherlands | Volkel AB | 11 | 44 | 11 | 44 | 11 | 44 |
| | Woensdrecht AB | 2 | 8* | 0 | 0 | 0 | 0 |
| South Korea | Kunsan AB | 36 | 144 | 0 | 0 | 0 | 0 |
| Turkey | Balikesir AB | 6 | 24 | 6** | 24 | 6** | 24 |
| | Erhac AB | 6 | 24 | 0 | 0 | 0 | 0 |
| | Eskishir AB | 6 | 24 | 0 | 0 | 0 | 0 |
| | Incirlik AB | 30 | 120 | 25 | 100 | 25 | 100 |
| | Murted (Akinci) AB | 6 | 24 | 6** | 24 | 6** | 24 |
| United Kingdom | RAF Bentwaters | 25 | 100 | 0 | 0 | 0 | 0 |
| | RAF Greenham | 2 | 8* | 0 | 0 | 0 | 0 |
| | Common | | | | | | |
| | RAF Lakenheath | 48 | 192 | 33 | 132 | 33 | 132 |
| | RAF Marham | 0 | 0 | 24 | 96 | 0 | 0 |
| | RAF Molesworth | 2 | 8* | 0 | 0 | 0 | 0 |
| | RAF Upper Heyford | 55 | 220 | 0 | 0 | 0 | 0 |
| Total | 28 sites | 437 | 1748 | 249 | 996 | 204 | 816 |

* For support of W80 warheads for the Ground-Launched Cruise Missile (GLCMs). It is not known how many W80s could be stored in each vault, but the W80 is much smaller than the B61 bomb, of which up to four can be stored in each WSV, so more than four W80s conceivably could have been stored in each WSV. The 1987 INF Treaty removed this requirement.

** WS3 site in caretaker status. MUNSS inactivated and no weapons present.

*** Memmingen Air Base closed in 2003.

Appendix C: Portraits of NATO Nuclear Bases in Europe

This appendix contains satellite images and maps of air bases in Europe where NATO currently stores nuclear weapons or maintains Weapons Storage Vaults capable of storing nuclear weapons if necessary. Details of the deployments and weapons storage facilities are described below each image and in Appendix A and Appendix B.

Satellite images were obtained for most of the bases, but in four cases (Akinci Air Base, Büchel Air Base, Nörvenich Air Base, and Volkel Air Base) satellite images were not available. Base maps were found for Büchel Air Base and Volkel Air Base, while an aerial photograph was obtained of Nörvenich Air Base. Only Akinci Air Base could not be illustrated.

The quality of the satellite images made it possible to clearly identify both the location and the size of the individual Protective Aircraft Shelters on the bases. The approximate size of the shelters was measured from the satellite images. In some cases, it was also possible to identify the Weapons Storage Area where nuclear weapons were kept before the Weapon Storage and Security System became operational in the 1990s.

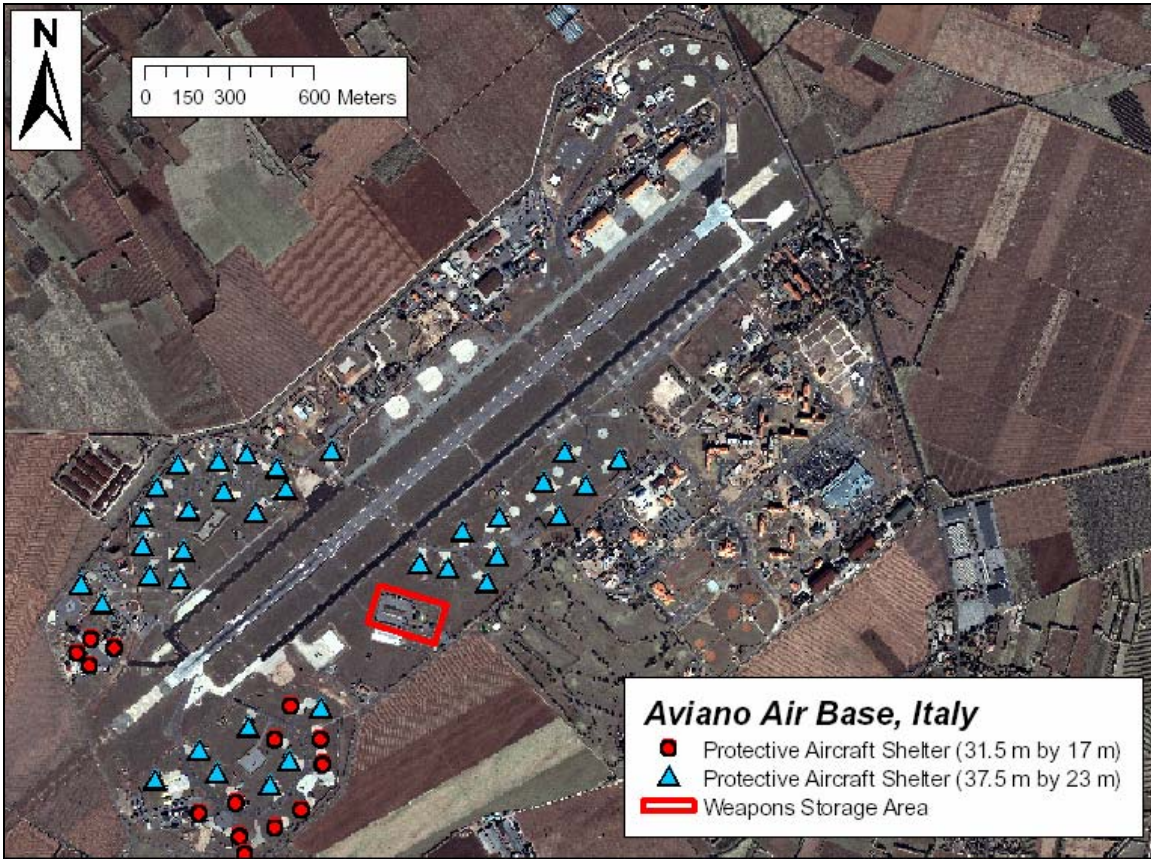
Each base contains more Protective Aircraft Shelters than are used for nuclear weapons storage. The satellite images and the information used in this report do not permit identification of which Protective Aircraft Shelters currently store the nuclear weapons.

Below follows the satellite images, photographs, or maps and descriptions of the following bases (note: the images are best viewed in color and all are available on the Internet at <http://www.nrdc.org/xxxx>):

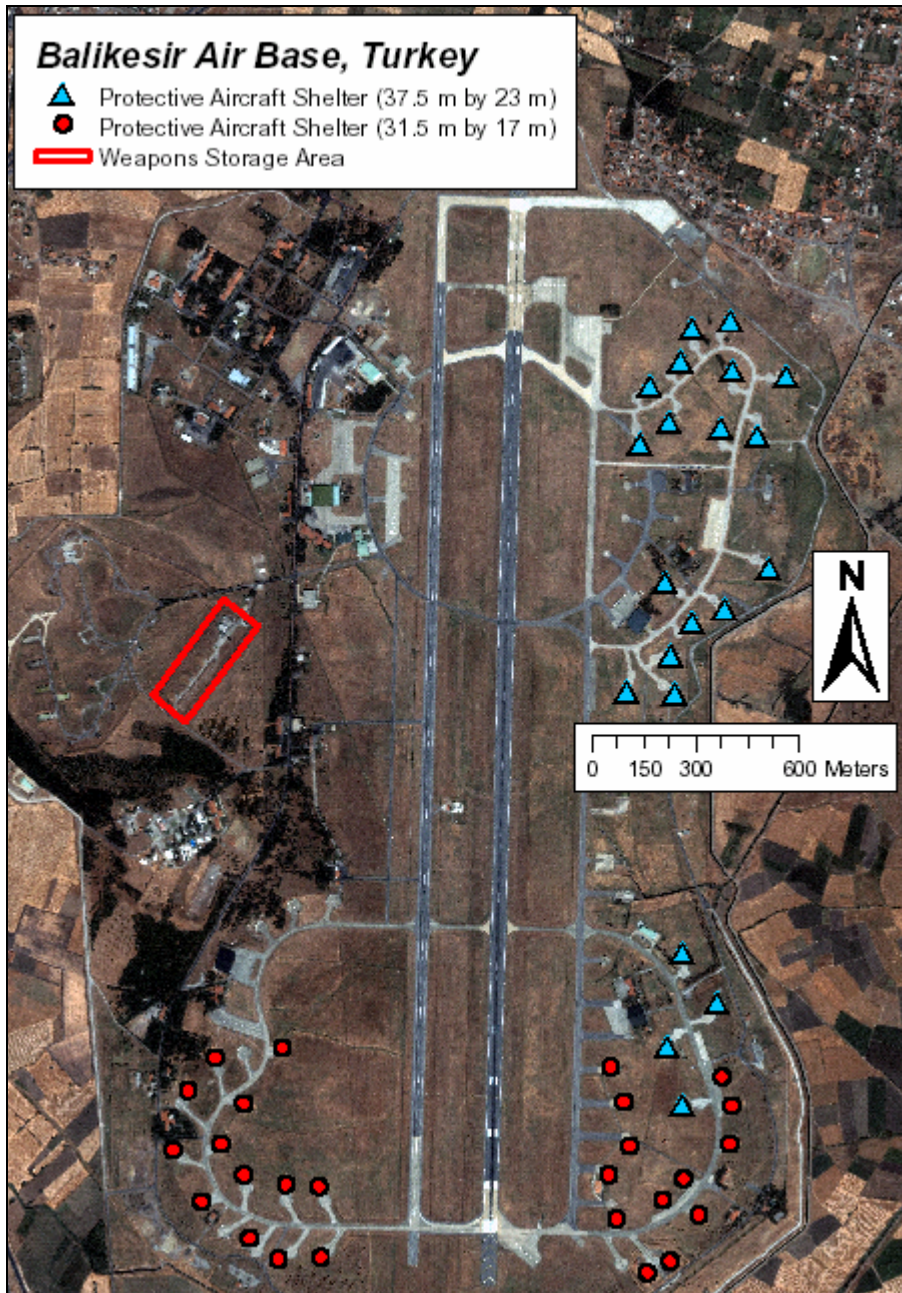
Araxos Air Base, Greece
Aviano Air Base, Italy
Balikesir Air Base, Turkey
Büchel Air Base, Germany
Gheddi Torre Air Base, Italy
Incirlik Air Base, Turkey
Kleine Brogel Air Base, Belgium
Nörvenich Air Base, Germany
RAF Lakenheath, United Kingdom
Ramstein Air Base, Germany
Volkel Air Base, Germany



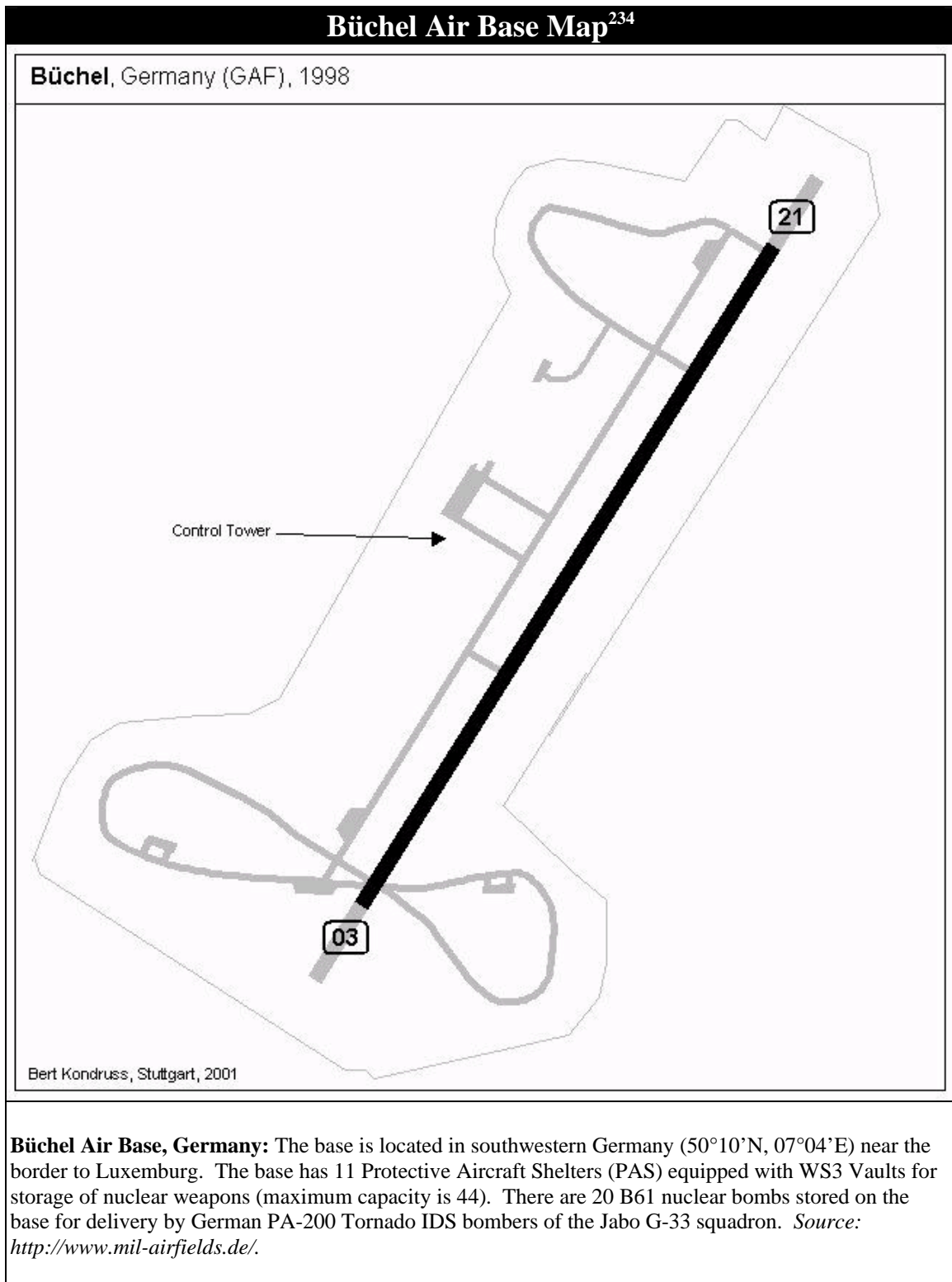
Araxos Air Base, Greece (September 5, 2003): This base is located on the northern tip (38°10'N, 21°25'N) of the island of Peloponnisos. There are 26 small Protective Aircraft Shelters (31.5x17 meters) on the base, six of which are equipped with WS3 Vaults for nuclear weapons storage with a maximum capacity of 44. The vaults were completed in 1997. Prior to that, nuclear weapons were stored in the Weapons Storage Area. The base stored 20 B61 nuclear bombs until the spring of 2001 for delivery by Greek A-7E/H Corsairs II of the 116th Wing's 335 Tiger and 336 Olympus squadrons. *Source: DigitalGlobe.*

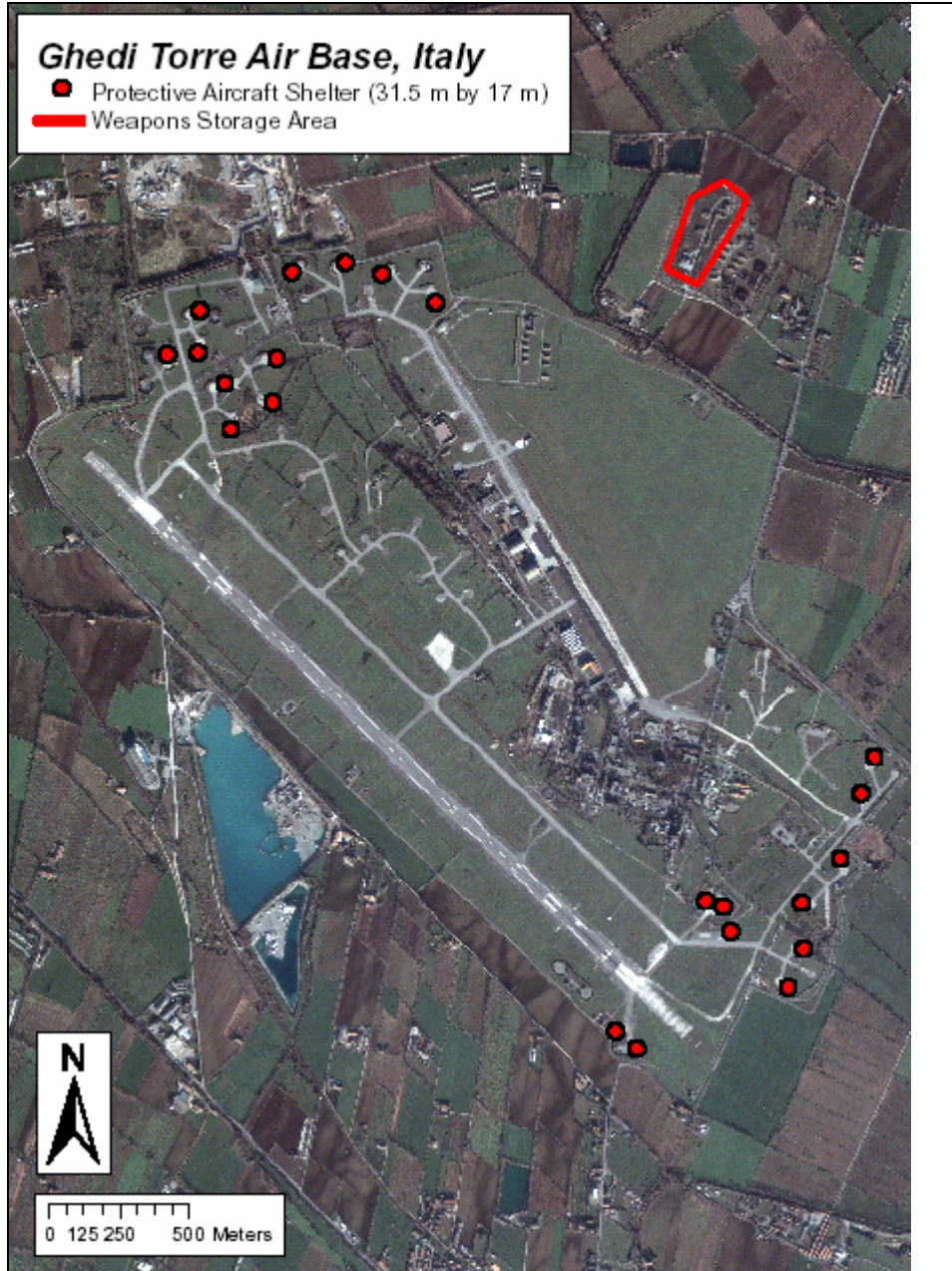


Aviano Air Base, Italy (October 15, 2003): This base is located in northeastern Italy (46°01'N, 12°35'E) near the Slovenian border. There are 49 Protective Aircraft Shelters on the base, 35 of which are large (37.5x23 meters) and the rest small (31.5x17 meters). Eighteen of the shelters are equipped with WS3 Vaults for nuclear weapons storage with a maximum capacity of 72. The vaults were completed in 1996. Prior to that, nuclear weapons were stored in the underground Weapons Storage Area. The base stores 50 B61 nuclear bombs for delivery by U.S. F-16C/D aircraft of the 31st Fighter Wing's 510th and 555th fighter squadrons. *Source: DigitalGlobe.*

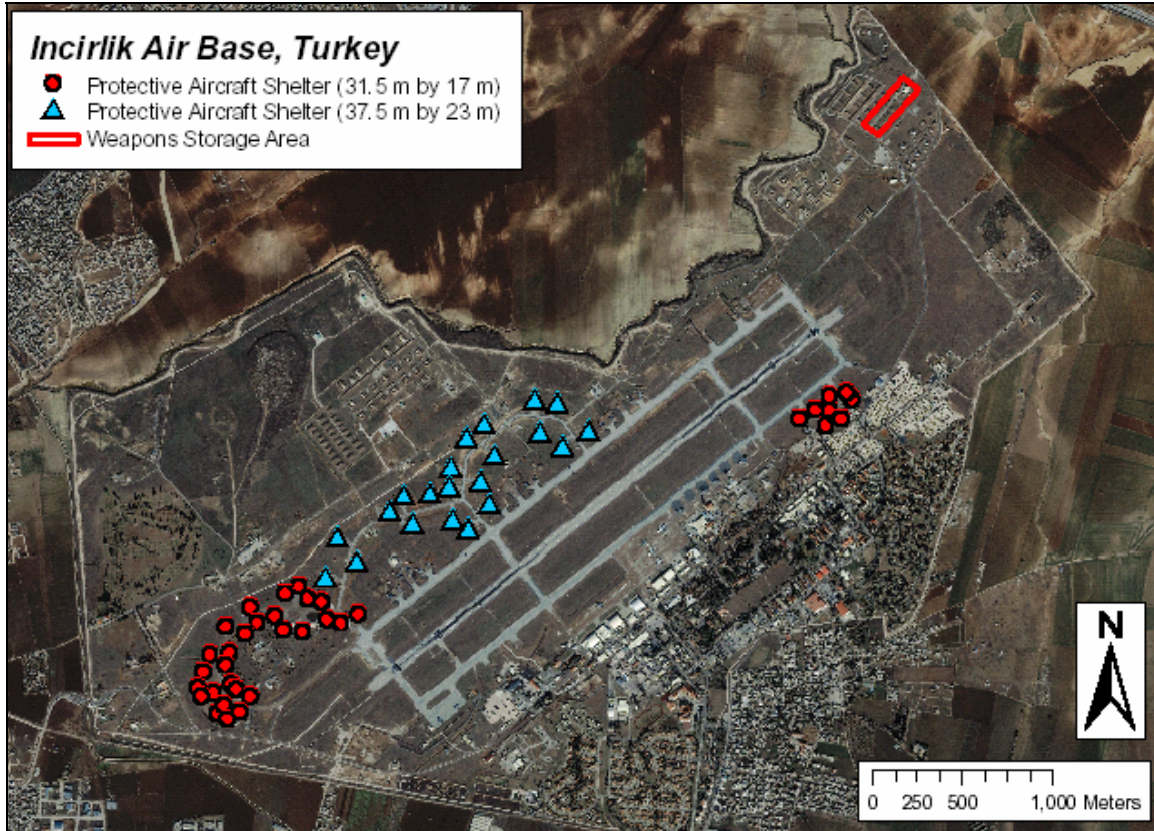


Balıkesir Air Base, Turkey (July 17, 2000): This base is located in western Turkey (39°37'N, 27°56'E). There are 47 Protective Aircraft Shelters (PAS) on the base, 21 of which are large (37.5x23 meters) and 26 smaller (31.5x17 meters) shelters. Six of the shelters are equipped with WS3 Vaults for nuclear weapons storage (maximum capacity of 24). The vaults were completed in 1997. Prior to that, nuclear weapons were stored in the Weapons Storage Area. The base stored 20 B61 nuclear bombs until 1995 for delivery by Turkish F-104G Starfighters (later F-16C/D) of the 9th Wing. Today, weapons are stored at Incirlik Air Base but still earmarked for delivery by the 191st and 192nd squadrons of the 9th Wing. *Source: Space Imaging.*

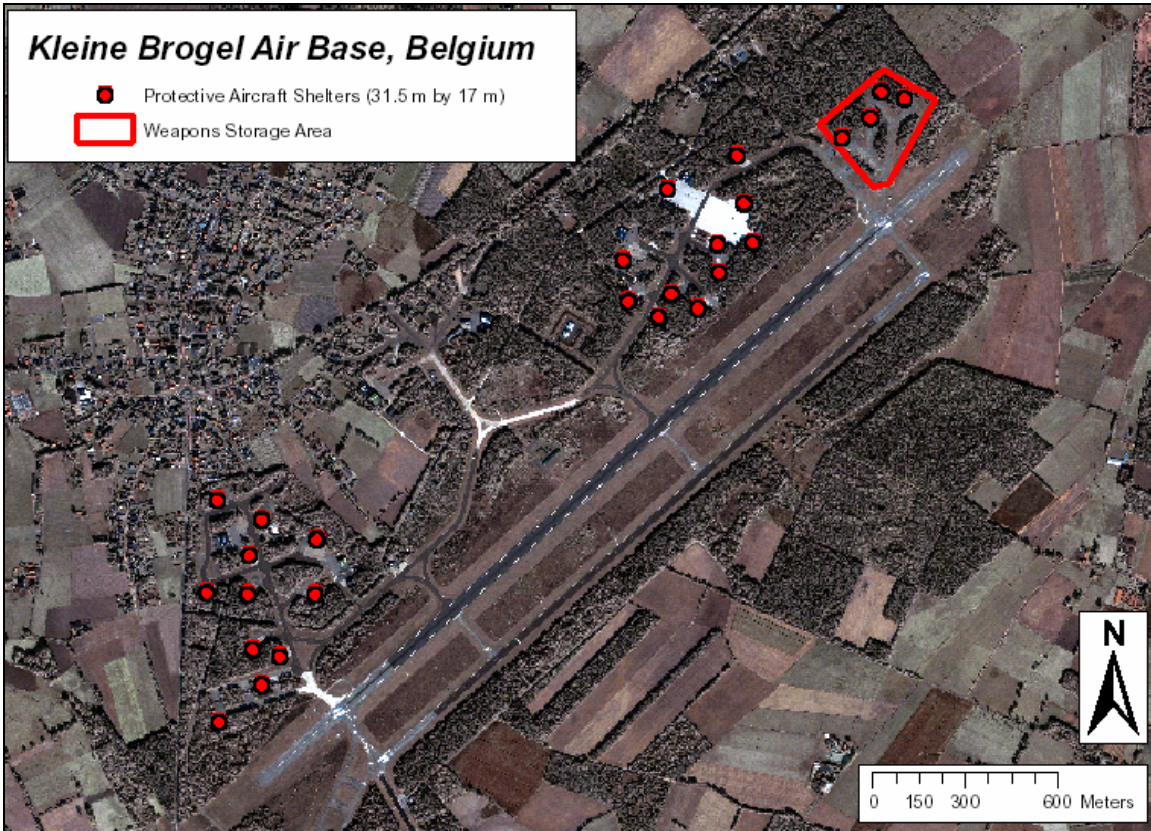




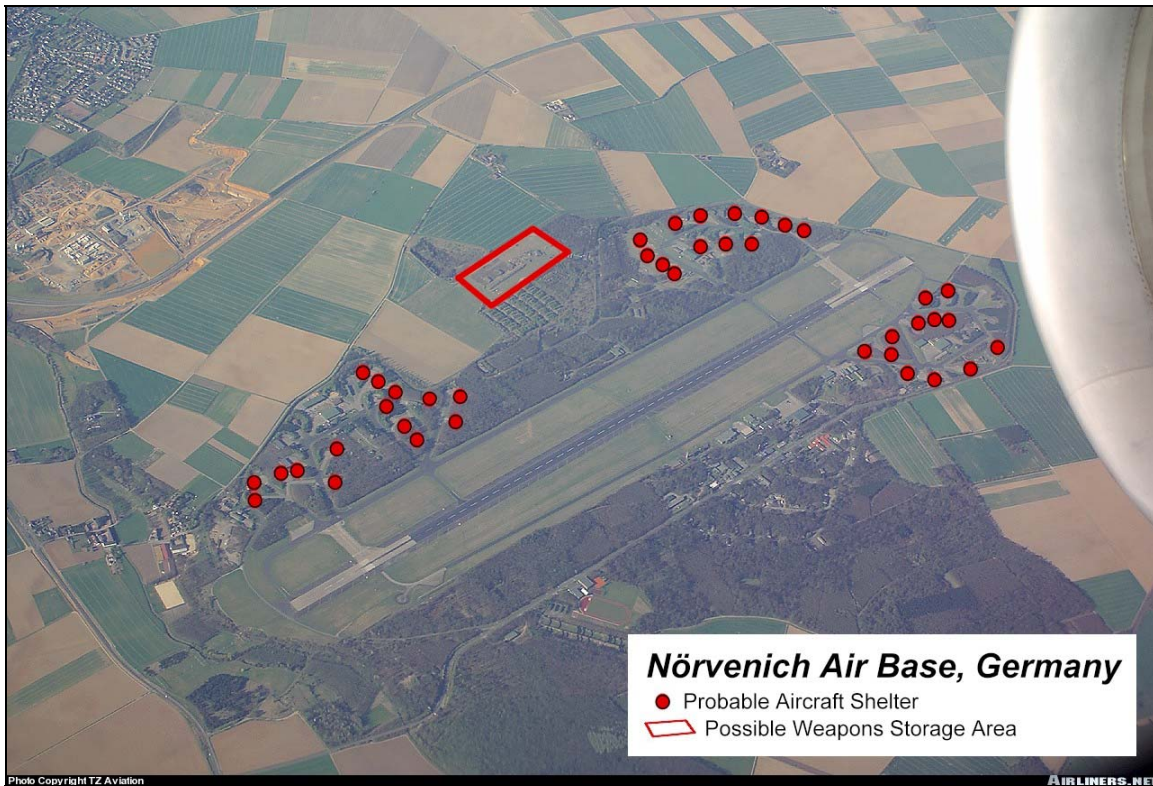
Ghedi Torre Air Base, Italy (January 15, 2003): This base is located in northern Italy (45°25'N, 10°16'E) near the town of Brescia. There are 22 Protective Aircraft Shelters (PAS) on the base, 11 of which are equipped with WS3 Vaults for nuclear weapons storage. The vaults, which have a maximum capacity of 44 weapons, were completed in 1997. Prior to that, nuclear weapons were stored in the Weapons Storage Area. The base stores 40 B61 nuclear bombs for delivery by Italian PA-200 Tornados of 6th Stormo Wing's 102nd and 154th squadrons. *Source: DigitalGlobe.*



Incirlik Air Base, Turkey (December 13, 2002): This base is located in southern Turkey (37°00'N, 35°26'E) near the Syrian border. There are 58 Protective Aircraft Shelters (PAS) on the base, 25 of which are equipped with WS3 Vaults for nuclear weapons storage. The vaults, which have a maximum capacity of 100 weapons, were completed in 1998. Prior to that, nuclear weapons were stored in the Weapons Storage Area. The base stores 90 B61 nuclear bombs, 50 of which are for delivery by U.S. F-16C/Ds from the 39th Fighter Wing, with the remaining 40 earmarked for delivery by the Turkish F-16 fighters of the 4th Wing at Akinci and 9th Wing at Balikesir. *Source: Space Imaging.*



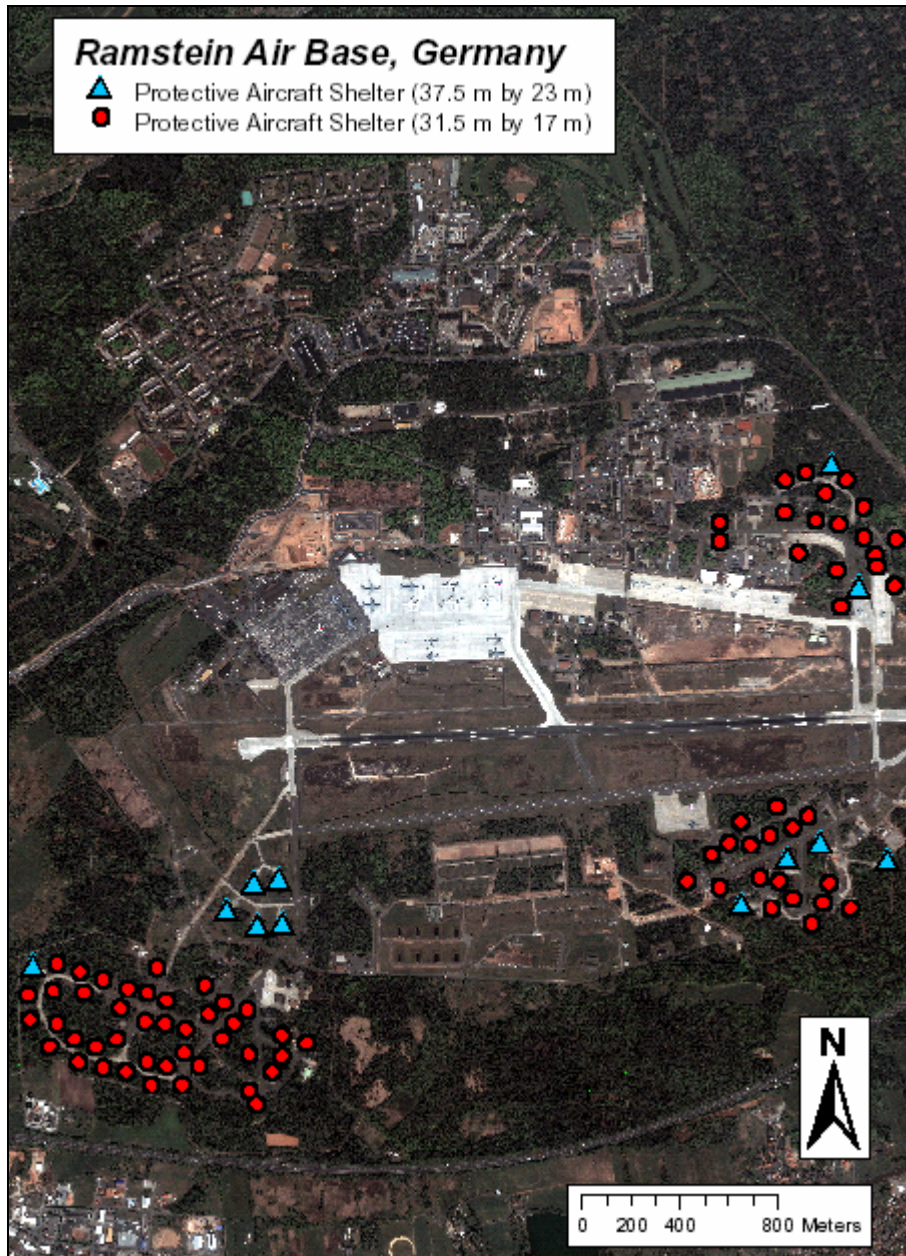
Kleine Brogel Air Base, Belgium (September 21, 2003): This base is located in northeastern Belgium (51°10'N, 05°28'E) near the Dutch border. There are 26 Protective Aircraft Shelters (PAS) on the base of the smaller type (31.5x17 meters), 11 of which are equipped with WS3 Vaults for nuclear weapons. The vaults, which have a maximum capacity of 44 weapons, were completed in 1992. Prior to that, nuclear weapons were stored in the Weapons Storage Area. Kleine Brogel stores 20 B61 nuclear bombs for delivery by Belgian F-16A/Bs of the 10th Wing's 31st and 349th squadrons. *Source: DigitalGlobe.*



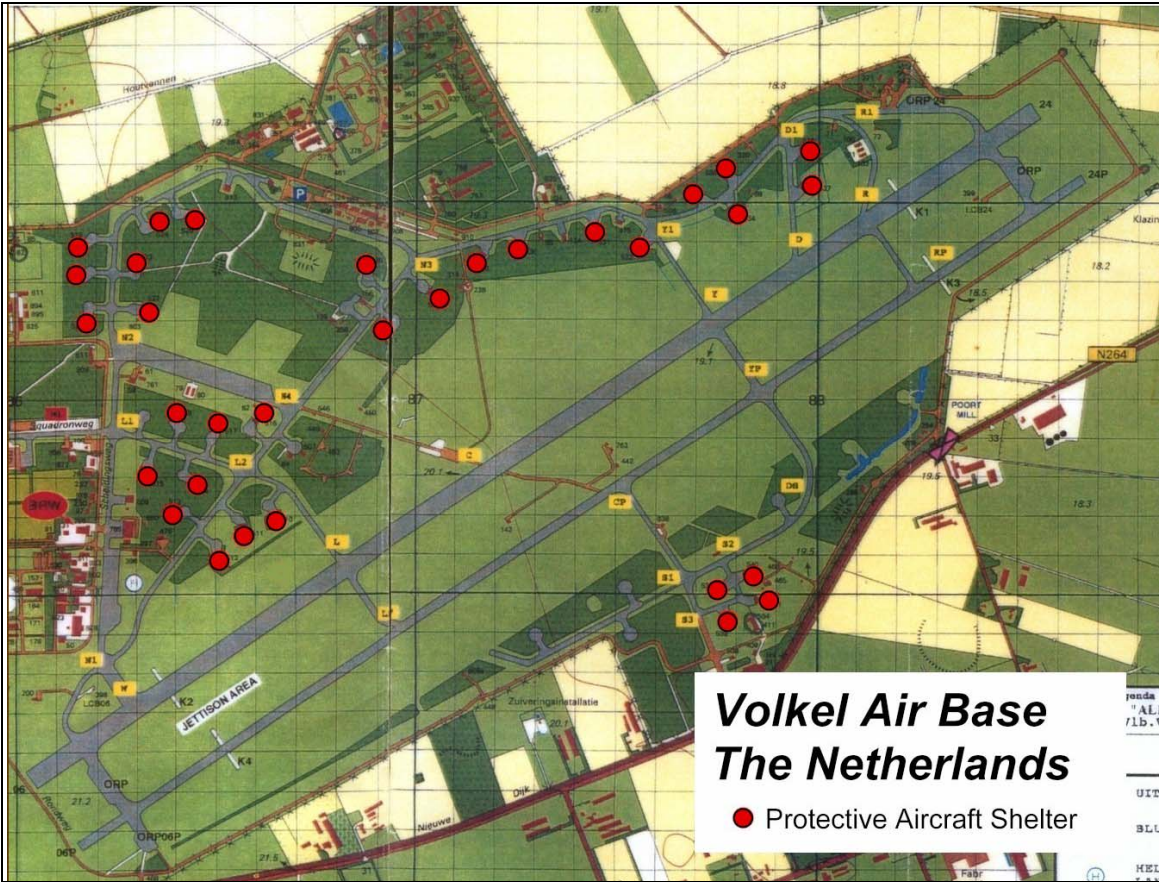
Nörvenich Air Base, Germany (April 15, 2003): The base is located in southwestern Germany (50°50'N, 06°40'E) near Bonn. Identification of Protective Aircraft Shelters (PAS) is uncertain from the low-resolution image available, but 11 of the shelters are known to be equipped with WS3 Vaults for storage of nuclear weapons (maximum capacity is 44). The vaults became operational in 1991. Prior to that, nuclear weapons were probably stored in what is possibly a Weapons Storage Area. Twenty B61 nuclear bombs were moved from the base to Ramstein Air Base in 1995, where they continue to be earmarked for delivery by the German PA-200 Tornado IDS bombers of the Jabo G-31 squadron based at Nörvenich Air Base. *Source: <http://www.airliners.net> (legends added).*



RAF Lakenheath, United Kingdom (March 27, 2003): This base is located in southwest England about 35 kilometers northeast of Cambridge (52°24'N, 00°33'E). There are 60 Protective Aircraft Shelters (PAS) on the base, all of the large version (37.5x23 meters). Thirty-three of these are equipped with WS3 Vaults for nuclear weapons storage. The vaults were completed in 1994. A total of 110 B61 nuclear bombs are stored at the base for delivery by U.S. F-15E of the 492nd and 494th fighter squadrons of the 48th Fighter Wing. *Source: DigitalGlobe.*



Ramstein Air Base, Germany (May 8, 2003): This base is located in southern Germany (49°26'N, 07°36'E) south of Mannheim. There are 90 Protective Aircraft Shelters (PAS) on the base, 12 of which are the large version (37.5x23 meters) and 78 the smaller shelters (31.5x17 meters). Fifty-five of the shelters are equipped with WS3 Vaults for nuclear weapons storage with a capacity of 220. The vaults were completed in 1992. Up to 130 B61 nuclear bombs are stored at the base, depending on the status of the weapons removed from Memmingen Air Base and Araxos Air Base. Of these, up to 90 bombs are for delivery by U.S. F-16C/Ds of the 22nd and 23rd fighter squadrons of the 52nd Fighter Wing based at the nearby Spangdahlem Air Base. Up to 40 of the bombs are for delivery by German Air Force PA-200 Tornados. *Source: DigitalGlobe.*



Volkel Air Base, the Netherlands (July 20, 1999): The base is located in the southeastern parts of the Netherlands (51°39'N, 05°43'E). There are 32 Protective Air Shelters (PAS) on the base, 11 of which are equipped with WS3 Weapons Storage Vaults for nuclear weapons storage with a capacity of 44. The vaults were completed in 1991. Twenty B61 bombs are stored at the base for delivery by Dutch F-16A/Bs of the 311th and 312th fighter squadrons. *Source: Dutch Air Force (legends added).*²³⁵

| | |
|-----------|---|
| AB | Air Base |
| ACC | U.S. Air Combat Command |
| AFEUR | U.S. Air Forces in Europe |
| ALT | Alteration |
| AOI | Area of Interest |
| AOR | Area of Responsibility |
| BRAC | Base Realignments and Closures |
| C3 | Command, Control, and Communication |
| CENTCOM | Central Command |
| CFE | Conventional Forces Europe, Treaty on |
| CINC | Command in Chief ²³⁶ |
| CINCEUR | Command in Chief, U.S. European Command |
| CINCPAC | Commander in Chief, U.S. Pacific Command |
| CINCSTRAT | Commander in Chief, U.S. Strategic Command |
| CJCS | Chairman of the Joint Chiefs of Staff |
| CMS | Code Management System |
| CONPLAN | Concept Plan |
| CONUS | Continental United States |
| DCA | Dual-Capable Aircraft |
| DOD | Department of Defense |
| DOE | Department of Energy |
| DPC | Defence Planning Committee |
| EAM | Emergency Action message |
| EUCOM | U.S. European Command |
| FOIA | Freedom of Information Act |
| FNPI | Fighter Nuclear Procedures Inspection |
| FW | Fighter Wing |
| GLCM | Ground-Launched Cruise Missile |
| HAS | Hardened Aircraft Shelter |
| IG | Inspector General |
| INF | Intermediate-range Nuclear Forces, Treaty on |
| IOC | Initial Operational Capability |
| JCS | Joint Chiefs of Staff |
| JCTP | Joint Contact Team Program |
| JSCP | Joint Strategic Capabilities Plan |
| JSF | Joint Strike Fighter |
| LNSI | Limited/Local Nuclear Surety Inspection |
| LRINF | Longer-Range Intermediate-range Nuclear Forces |
| MC | Military Characteristics |
| MOB | Major Operating Base |
| MUNSS | Munitions Support Squadron |
| NATO | North Atlantic Treaty Organisation |
| NNCCRS | NATO Nuclear Command and Control Reporting System |
| NNPS | NATO Nuclear Planning System |

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|--------------|--|
| NPES | Nuclear Planning and Execution System |
| NPG | Nuclear Planning Group |
| NPR | Nuclear Posture Review |
| NPS | Nuclear Precautionary System |
| NSC | National Security Council |
| NSI | Nuclear Surety Inspection |
| NUWEP | Nuclear Weapons Employment Policy |
| NWDP | Nuclear Weapons Deployment Plan |
| NWSSG | Nuclear Weapons System Safety Group |
| OPLAN | Operational Plan |
| OPDD | Operational Plan Data Document |
| ORD | Operational Requirements Document |
| ORI | Operational Readiness Inspection |
| OSR | Operational Safety Review |
| PAL | Permission Action Link |
| PAS | Protective Aircraft Shelter |
| PDD | Presidential Decision Directive |
| PRP | Personal Reliability Program |
| RAF | Royal Air Force |
| RDT&E | Research, Development, Test, and Evaluation |
| RSG | Regional Support Group |
| SACEUR | Supreme Allied Command Europe |
| SAG | Strategic Advisory Group |
| SAV | Staff Assistance Visit |
| SHAPE | Supreme Headquarters Allied Powers Europe |
| SILVER Books | Strategic Installation List of Vulnerability Effects and Results Books |
| SIOP | Single Integrated Operational Plan |
| SLCM | Sea-Launched Cruise Missile |
| SNL | Sandia National Laboratory |
| START | Strategic Arms Reduction Treaty |
| STRATCOM | U.S. Strategic Command |
| SWPS | Strategic War Planning System |
| TAC EVAL | Tactical Evaluation |
| TNO | Theater Nuclear Option |
| USACOM | U.S. Atlantic Command (now U.S. Joint Forces Command) |
| WMD | Weapons of Mass Destruction |
| WMT | Weapons Maintenance Truck |
| WS3 | Weapons Storage and Security System |
| WSA | Weapons Storage Area |
| WSV | Weapons Storage Vault |