



# Army Quarterly Pediatric Lead Report (Calendar Year (CY) 2022 Quarter (Q1))

## QUARTERLY HIGHLIGHT

**1,533 Army Dependents**

received a blood lead test between 1 January and 31 March 2022; 1.2% of those tests indicated an elevated blood lead level (e BLL). This quarterly report uses laboratory data based on the updated Centers for Disease Control and Prevention reference value for an e BLL ( $\geq 3.5 \mu\text{g/dL}$ ).

### INTRODUCTION

Lead is a naturally occurring heavy metal but can present an environmental and health hazard if it contaminates water, air, soil, or dust. In the U.S., the most common ways that people are exposed to lead are the inhalation or accidental ingestion of contaminated dust and soil as a result of aging or chipping lead-based paint.<sup>1,2</sup> Lead-based paint was banned from use in the U.S. in 1978, but many homes built prior to the ban still exist in communities across the country. Other potential sources of lead exposure are contaminated water, ammunition, soldering equipment, as well as some foreign-made toys, ceramics, make-up, and packaged foods.

Lead is neurotoxic and can cause cognitive and behavioral issues, as well as gastrointestinal and hematological problems.<sup>2,3</sup> Children are at higher risk of lead exposure because of their more frequent hand-to-mouth behavior. They are also more susceptible to the harmful effects of lead since the brain is in a period of rapid development during childhood.

Because children are at higher risk if exposed to lead, the American Academy of Pediatrics recommends that all children aged 6 months to 6 years, inclusive, be screened for increased risk of lead exposure via a parental questionnaire administered at routine well-child visits.<sup>3</sup> Children who screen positive for an increased exposure risk should be tested for an elevated blood lead level (e BLL). Laws regarding lead exposure screening, testing, and reporting are established at the State level, and Army regulation directs installations to comply with State law.<sup>3</sup>

In 2021, the Centers for Disease Control and Prevention (CDC) lowered the e BLL reference value from 5 micrograms per deciliter ( $\mu\text{g/dL}$ ) to  $3.5 \mu\text{g/dL}$ .<sup>4</sup> This updated reference value was derived from the 97.5th percentile of the blood lead values among U.S. children aged 1 to 5 years, resulting from the 2015–2016 and 2017–2018 National Health and Nutrition Examination Survey cycles. The CDC reference value should not be interpreted as a “safe” level, and the CDC continues to stress that there is no safe level of lead exposure.

In October 2018, e BLLs were established as a reportable medical event (RME) for Army dependents aged 0 to 6 years, according to the Army Lead Hazard Management Control Program.<sup>5</sup> Army dependents with e BLLs must be reported to the Disease Reporting System internet (DRSi) according to Armed Forces Health Surveillance Division guidelines. The Tri-Service Reportable Medical Event Working Group is in the process of updating the case definition of the elevated blood lead RME to reflect the change in the CDC reference value.

This quarterly report tracks all available BLL laboratory test results within the Army dependent population and monitors the occurrence of e BLLs. This iteration will use the new CDC reference value for e BLL ( $3.5 \mu\text{g/dL}$ ).

### METHODS

#### Laboratory Data

The Navy and Marine Corps Public Health Center (NMCPHC) provided available BLL laboratory results for Army dependents from the Composite Health Care System (CHCS) Health Level 7 (HL7) chemistry data system and Military

Health System (MHS) GENESIS. Records are dated according to the BLL collection date, and this report covers test results collected from 1 January through 31 March 2022 (CY2022 Q1). The data include all BLL test results above and below the eBLL cutoff collected within the MHS. These include test results for Army dependents who receive care at Army medical treatment facilities (MTFs) and other Department of Defense facilities. Test results were excluded from the analysis when the unit of measure or the result could not be determined, or the biological sample was not blood.<sup>6</sup> Zinc photoporphyrin (ZPP), point of care (POC), and capillary blood tests (n=13) were also not included as these tests are not considered in the case definition in the *Armed Forces Reportable Medical Events – Guidelines and Case Definitions*<sup>7</sup>, hereafter referred to as the Armed Forces RME Guidelines.

Only BLL results for Army dependents aged 0 to 6 years were analyzed for this report. According to the Armed Forces RME Guidelines, a child can be counted as an eBLL case only once per calendar year.<sup>7</sup> If an individual had more than one BLL result (e.g., duplicate record or follow-up blood test) during CY2022 Q1, the highest BLL result was retained. The frequency of BLL test results is displayed by BLL range (<3.5 µg/dL, 3.5–9 µg/dL, 10–19 µg/dL, ≥20 µg/dL), Regional Health Command (RHC), and installation. Results ≥3.5 µg/dL are considered elevated. All CY2022 Q1 eBLL test results are reported.

### Disease Reporting System, Internet Data

The DRSi is a tri-service reportable medical event system. Since 18 October 2018, eBLLs have been reportable through the DRSi for children aged 0 to 6 years.<sup>5</sup> The Armed Forces RME Guidelines case definition for an eBLL (≥5 µg/dL) has not been updated to reflect the current CDC cut-off value (3.5 µg/dL).<sup>7</sup> Therefore, only eBLL cases that meet the current Armed Forces RME Guidelines case definition are included in the summary of DRSi data and in the reporting compliance calculation described below. Only Army dependent cases reported to DRSi are included in this report. Among Army dependents, DRSi cases with medical event report dates from 1 January through 31 March 2022 were counted.

### DRSi Reporting Compliance

DRSi report dates can differ from the BLL test collection date. Taking this into consideration, cases with test collection dates during CY2022 Q1 were considered in the measure of compliance with the eBLL reporting policy. Reporting compliance was determined using the proportion of eBLL laboratory results within CHCS and MHS GENESIS collected during CY2022 Q1 that were also reported via a medical event report in DRSi. Only eBLL cases that meet the current Armed Forces RME Guidelines case definition for eBLL (≥5 µg/dL) were counted in the compliance measure.<sup>7</sup>

### Army Public Health Nurses Program Status Report (APHN-PSR)

Starting in April 2019, specific questions regarding childhood lead exposure were included in the APHN-PSR to assess the Environmental Health Hazard Management Control Program.<sup>8</sup> As part of installation safety and housing office-led environmental investigations, the installation’s Department of Public Health (Preventive Medicine Services) conducts parent/guardian interviews after a child 6 years of age or younger is confirmed to have an eBLL. The APHN-PSR captures the following Lead Hazard Management Control Plan metrics: (1) number of pediatric BLL tests conducted in the past fiscal quarter reported to the State/local authorities; (2) number of confirmed elevated pediatric BLL test results in the past fiscal quarter reported to the State/local authorities per the State/local reporting requirements.

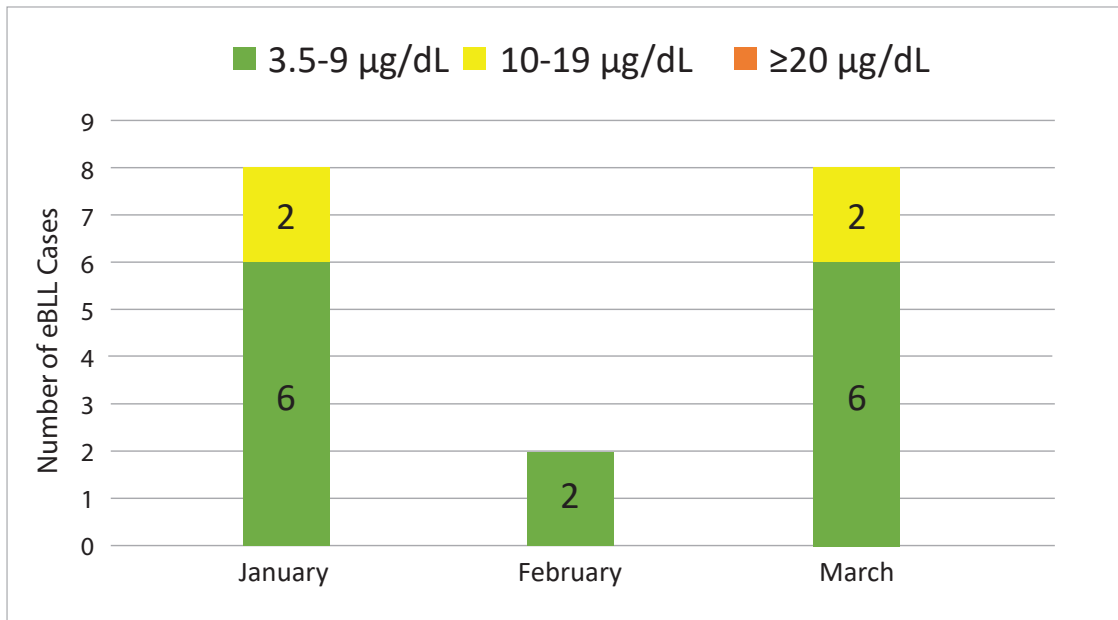
## RESULTS

### Laboratory Test Results

During CY2022 Q1, 1,533 Army dependents aged 0 to 6 years received a blood lead test within the MHS; 18 of those results (1.2%) indicated an elevated BLL (≥3.5 µg/dL), as shown in Table 1 and Figure 1. In CY2022 Q1, no child’s BLL exceeded the level at which chelation therapy is typically recommended (≥45 µg/dL) or fell within the highest range (≥20 µg/dL, Table 1).

**Table 1.** Total Count of Pediatric (ages 0–6) Blood Lead Levels in CY2022 Q1

| BLL Ranges (µg/dL) | CY2022 Q1<br>n (%)  |
|--------------------|---------------------|
| <3.5               | 1,515 (98.8%)       |
| 3.5–9              | 14 (0.9%)           |
| 10–19              | 4 (0.3%)            |
| ≥20                | 0 (0%)              |
| <b>Total</b>       | <b>1,533 (100%)</b> |



**Figure 1.** Number of Elevated Blood Lead Cases ( $\geq 3.5$   $\mu\text{g}/\text{dL}$ ) by Month in CY2022 Q1  
Data source: CHCS HL7 and MHS GENESIS

The highest BLL test results from CY2022 Q1 were retained for each child dependent; Table 2 summarizes these BLLs by RHC and installation. The elevated BLL results were from Fort (Ft.) Belvoir (2), Ft. Bragg (1), Ft. Drum (1), Ft. Hood (3), Ft. Leavenworth (1), Ft. Lee (1), Ft. Meade (1), Ft. Sill (1), Ft. Stewart (1), Ft. Wainwright (1), Joint Base (JB) Lewis-McChord (1), JB McGuire-Dix-Lakehurst (1), JB San Antonio (2), and Walter Reed National Military Medical Center (NMMC) (1). Appendix A shows a list of U.S. Air Force (USAF), Marine Corps, and Navy locations where Army dependents received BLL testing during CY2022 Q1.

**Table 2.** Pediatric (ages 0–6) Blood Lead Levels (BLL), by Region and Installation, CY2022 Q1.

| REGION                  | BLL Ranges                   |                               |                               |                                   | Total |
|-------------------------|------------------------------|-------------------------------|-------------------------------|-----------------------------------|-------|
|                         | <3.5 $\mu\text{g}/\text{dL}$ | 3.5–9 $\mu\text{g}/\text{dL}$ | 10–19 $\mu\text{g}/\text{dL}$ | $\geq 20$ $\mu\text{g}/\text{dL}$ |       |
| <b>ATLANTIC</b>         |                              |                               |                               |                                   |       |
| Aberdeen Proving Ground | 20                           | 0                             | 0                             | 0                                 | 20    |
| Ft. Belvoir             | 57                           | 2                             | 0                             | 0                                 | 59    |
| Ft. Benning             | 89                           | 0                             | 0                             | 0                                 | 89    |
| Ft. Bragg*              | 153                          | 1                             | 0                             | 0                                 | 154   |
| Ft. Campbell*           | 28                           | 0                             | 0                             | 0                                 | 28    |
| Ft. Detrick             | 3                            | 0                             | 0                             | 0                                 | 3     |
| Ft. Drum*               | 84                           | 1                             | 0                             | 0                                 | 85    |
| Ft. Gordon              | 2                            | 0                             | 0                             | 0                                 | 2     |
| Ft. Jackson             | 4                            | 0                             | 0                             | 0                                 | 4     |
| Ft. Knox                | 44                           | 0                             | 0                             | 0                                 | 44    |
| Ft. Lee*                | 10                           | 0                             | 1                             | 0                                 | 11    |
| Ft. Meade               | 24                           | 1                             | 0                             | 0                                 | 25    |
| Ft. Rucker              | 25                           | 0                             | 0                             | 0                                 | 25    |
| Ft. Stewart*            | 36                           | 1                             | 0                             | 0                                 | 37    |
| Redstone Arsenal        | 1                            | 0                             | 0                             | 0                                 | 1     |
| Walter Reed NMMC*       | 69                           | 1                             | 0                             | 0                                 | 70    |
| West Point              | 14                           | 0                             | 0                             | 0                                 | 14    |
| <b>CENTRAL</b>          |                              |                               |                               |                                   |       |
| Ft. Bliss               | 205                          | 0                             | 0                             | 0                                 | 205   |
| Ft. Carson              | 11                           | 0                             | 0                             | 0                                 | 11    |

**Table 2 (continued).** Pediatric (ages 0–6) Blood Lead Levels (BLL), by Region and Installation, CY2022 Q1.

| REGION                            | BLL Ranges |             |             |           | Total |
|-----------------------------------|------------|-------------|-------------|-----------|-------|
|                                   | <3.5 µg/dL | 3.5–9 µg/dL | 10–19 µg/dL | ≥20 µg/dL |       |
| Ft. Hood*                         | 173        | 1           | 2           | 0         | 176   |
| Ft. Huachuca                      | 3          | 0           | 0           | 0         | 3     |
| Ft. Irwin                         | 3          | 0           | 0           | 0         | 3     |
| Ft. Leavenworth*                  | 17         | 1           | 0           | 0         | 18    |
| Ft. Leonard Wood                  | 15         | 0           | 0           | 0         | 15    |
| Ft. Polk                          | 33         | 0           | 0           | 0         | 33    |
| Ft. Riley                         | 21         | 0           | 0           | 0         | 21    |
| Ft. Sill*                         | 39         | 1           | 0           | 0         | 40    |
| <b>PACIFIC</b>                    |            |             |             |           |       |
| Camp Humphreys                    | 1          | 0           | 0           | 0         | 1     |
| Ft. Shafter                       | 2          | 0           | 0           | 0         | 2     |
| Ft. Wainwright                    | 9          | 0           | 1           | 0         | 10    |
| Schofield Barracks                | 9          | 0           | 0           | 0         | 9     |
| <b>EUROPE</b>                     |            |             |             |           |       |
| Grafenwoehr                       | 18         | 0           | 0           | 0         | 18    |
| Hohenfels/Amberg                  | 1          | 0           | 0           | 0         | 1     |
| Landstuhl                         | 25         | 0           | 0           | 0         | 25    |
| Vicenza                           | 7          | 0           | 0           | 0         | 7     |
| Vilseck                           | 16         | 0           | 0           | 0         | 16    |
| <b>JOINT BASES</b>                |            |             |             |           |       |
| Joint Base Elmendorf-Richardson   | 6          | 0           | 0           | 0         | 6     |
| Joint Base Langley-Eustis         | 35         | 0           | 0           | 0         | 35    |
| Joint Base Lewis-McChord          | 9          | 1           | 0           | 0         | 10    |
| Joint Base Little Creek-Ft. Story | 1          | 0           | 0           | 0         | 1     |
| Joint Base McGuire-Dix-Lakehurst  | 9          | 1           | 0           | 0         | 10    |
| Joint Base Meyer-Henderson Hall   | 4          | 0           | 0           | 0         | 4     |
| Joint Base San Antonio*           | 98         | 2           | 0           | 0         | 100   |
| <b>USAF MTF**</b>                 |            |             |             |           |       |
|                                   | 62         | 0           | 0           | 0         | 62    |
| <b>NAVAL/MARINE CORPS MTF**</b>   |            |             |             |           |       |
|                                   | 20         | 0           | 0           | 0         | 20    |

\*elevated blood lead level (eBLL ≥3.5 µg/dL) result in CY2022 Q1

\*\* list of USAF, Naval, and Marine Corps locations in Appendix A

### DRSi Reporting Results

Two eBLL cases among Army dependents were reported in DRSi during CY2022 Q1. Ft. Hood and Ft. Shafter–Tripler each reported one case.

### DRSi Reporting Compliance

Ten out of the 18 eBLL cases identified in the CHCS and MHS GENESIS laboratory data met the Armed Forces RME Guidelines case definition for eBLL. One of these cases was reported to DRSi; a 10% reporting compliance for CY2022 Q1. Three cases reported in CY2021 had new eBLL results recorded in CY2022 and should have been reported to DRSi again. Ft. Belvoir, Ft. Bragg, Ft. Hood, Ft. Leavenworth, Ft. Lee, Ft. Stewart, Ft. Wainwright, Joint Base Lewis-McChord, and Walter Reed NMMC each had one unreported eBLL case from CY2022 Q1.

### Army Public Health Nurses Program Status Report (APHN-PSR)

The results of the APHN-PSR indicated that a total of 536 BLL test results were reported to State and/or local authorities during CY2022 Q1 (Table 3). The APHN-PSR question related to pediatric lead is relevant for installations located in State and local jurisdictions that require reporting of all BLL test results, including those below 3.5 µg/dL (e.g., Louisiana, New York, North Carolina). RHC-Central reported the most BLL test results to State and local authorities (n=411), followed by RHC-Atlantic (n=120). Eight (1.5%) of those results (n=536) indicated elevated BLLs.

**Table 3.** Blood Lead Levels (BLL) Reported through the APHN-PSR by Region and Installation, CY2022 Q1

| REGION                     | Number of BLL tests reported to the State/local authorities | Number of eBLL tests reported to the State/local authorities |
|----------------------------|---|--|
| <b>ATLANTIC</b>            |   |  |
| Ft. Belvoir                | 88  | 0  |
| Ft. Bragg                  | 1   | 1  |
| Ft. Lee                    | 1   | 0  |
| Joint Base Langley-Eustis  | 29  | 0  |
| Redstone Arsenal           | 1   | 0  |
| <b>CENTRAL</b>             |   |  |
| Ft. Bliss                  | 208   | 0  |
| Ft. Carson                 | 42  | 0  |
| Ft. Hood                   | 127   | 1  |
| Ft. Huachuca               | 5   | 5  |
| Ft. Leavenworth            | 0   | 1  |
| Ft. Polk                   | 29  | 0  |
| <b>PACIFIC</b>             |   |  |
| Tripler/Schofield Barracks | 5   | 0  |

Note: Installations that are not listed did not report BLL tests or eBLL ( $\geq 3.5$   $\mu\text{g}/\text{dL}$ ) tests.

## DISCUSSION

Approximately 1.2% of the results of BLL tests performed in CY2022 (1 January – 31 March 2022) indicated eBLLs. Because of the lower reference value for eBLL, eight additional children with an eBLL were identified. The number of Army dependents tested during CY2022 Q1 compared to CY2021 Q1 ( $n=2,430$  BLL tests) decreased by 37%. It is unclear whether the decrease in dependents tested for blood lead is due to the continued impact on preventive care during the pandemic or if more dependents are seeking care outside the MHS.<sup>9</sup>

Since there is no safe level of lead in the blood, the Army will continue its Lead Hazard Management Control Program to prevent childhood lead exposure and monitor children with an eBLL to ensure each case receives proper treatment and management. Reporting eBLLs to DRSi is an important aspect of that control and prevention program. This quarter, military MTFs reached 10% reporting compliance, a rate lower than any at point in CY2021 (Q1–Q4 reporting compliance range: 29–88%). While RME reporting has become more challenging during the COVID-19 pandemic, improvement of eBLL case reporting is critical to reliably identifying installations where children may be at increased risk of lead exposure. Children with an eBLL are reportable to DRSi once per calendar year. The CY2021 reporting year has ended, and a new medical event report should be submitted for any eBLL cases reported in CY2021 that indicated an eBLL on a repeat test in CY2022. Contact the Disease Epidemiology Branch ([usarmy.apg.medcom-aphc.mbx.disease-epidemiologyprogram13@mail.mil](mailto:usarmy.apg.medcom-aphc.mbx.disease-epidemiologyprogram13@mail.mil)) for any questions regarding DRSi reporting of eBLLs.

## LIMITATIONS

This report may not include all Army dependent BLL test results. The NMCPHC extracted the blood lead laboratory results from CHCS and MHS GENESIS one month after the end of Q1 to minimize the chance of missing any results collected during that quarter. However, it is still possible that some of the results were not certified by the laboratory and entered into CHCS or MHS GENESIS at the time the Navy did the data extraction.

The inclusion of MHS GENESIS laboratory data in this report is new. The MHS GENESIS data provided by the NMCPHC were included in this report to provide some visibility on the installations that have converted to that electronic medical record system. At the time of this publication, these include Ft. Carson, Ft. Irwin, Ft. Leavenworth, Ft. Leonard Wood, Ft. Riley, Ft. Shafter, Ft. Wainwright, JB Lewis-McChord, JB Elmendorf-Richardson, Presidio of Monterey, and Schofield Barracks. However, the NMCPHC is still examining the quality and completeness of these data. In addition, only BLLs collected within the MHS are available through either CHCS or MHS GENESIS, meaning blood samples collected and tested outside the MHS are not represented in this report.

To improve BLL surveillance, the Army established a RME for eBLLs in children 0 to 6 years old. The Air Force similarly reports eBLLs through DRSi. The Armed Forces RME Guidelines elevated blood lead case definition has not been updated to reflect the current CDC reference value, so children with BLL between 3.5 – 5  $\mu\text{g}/\text{dL}$  may not have been

reported to DRSi. The Navy relies solely on laboratory data and does not report eBLLs through DRSi, so it is possible that those cases will not be immediately visible to the APHC. However, the data from CHCS/MHS GENESIS show that there were no eBLLs among the Army dependents who received BLL tests at Navy or Marine Corps MTFs.

## REFERENCES

1. "Protect Your Family from Exposures to Lead," United States Environmental Protection Agency (EPA). <https://www.epa.gov/lead/protect-your-family-exposures-lead#sl-home>
2. EPA. 2018. *Federal Action Plan to Reduce Childhood Lead Exposure and Associated Health Impacts*. President's Task Force on Environmental Health Risks and Safety Risks to Children. [https://www.epa.gov/sites/production/files/2018-12/documents/fedactionplan\\_lead\\_final.pdf](https://www.epa.gov/sites/production/files/2018-12/documents/fedactionplan_lead_final.pdf)
3. Council on Environmental Health. 2016. Prevention of Childhood Lead Toxicity. *Pediatrics*. 138(1):e20161493. doi: 10.1542/peds.2016-1493
4. Schnur, J and RM John. 2014. Childhood lead poisoning and the new Centers for Disease Control and Prevention guidelines for lead exposure. *J Am Assoc Nurse Pract*. 26(5):238-247. doi: 10.1002/2327-6924.12112
5. Memorandum, Department of the Army, October 17, 2018; OTSG/MEDCOM Policy Memo 18-064. Subject: *Preventing Childhood Lead Exposure – Lead Hazard Management*.
6. Navy and Marine Corps Public Health Center EpiData Center Department. 2019. *NMCPHC-EDC-TR-061-2019, DOD Quarterly Pediatric Lead Report, CY 2018 Q4*.
7. Defense Health Agency. 2020. *Armed Forces Reportable Medical Events – Guidelines and Case Definitions*. <https://health.mil/Military-Health-Topics/Combat-Support/Armed-Forces-Health-Surveillance-Branch/Reports-and-Publications>
8. Headquarters, U.S. Army Medical Command, January 7, 2021; USAMEDCOM Operations Order 21-17. *Environmental Health Hazard Management Control Plan*. Falls Church, VA.
9. Lebrun-Harris LA, OR Sappenfield, and MD Warren. 2021. "Missed and Delayed Preventive Health Care Visits Among US Children Due to the COVID-19 Pandemic." *Public Health Rep*, Online ahead of print. doi: 10.1177/00333549211061322

# Appendix A

**Table A-1.** U.S. Air Force, Navy, and Marine Corps locations where Army Dependents Received a Blood Lead Test, CY2022

| USAF Bases           | Naval/Marine Corps Stations |
|----------------------|-----------------------------|
| Aviano AB            | Camp Lejeune                |
| Barksdale AFB        | JB Charleston               |
| Davis-Monthan AFB    | JB Marianas Guam-Andersen   |
| Dover AFB            | Portsmouth                  |
| Eglin AFB            | Quantico                    |
| Goodfellow AFB       | Virginia Beach              |
| Grand Forks AFB      |                             |
| Hanscom AFB          |                             |
| JB Anacostia-Bolling |                             |
| JB Andrews           |                             |
| Kadena AB            |                             |
| Keesler AFB          |                             |
| Little Rock AFB      |                             |
| Los Angeles AFB      |                             |
| Luke AFB             |                             |
| MacDill AFB          |                             |
| Maxwell AFB          |                             |
| McConnell AFB        |                             |
| Nellis AFB           |                             |
| Offutt AFB           |                             |
| Patrick AFB          |                             |
| Peterson AFB         |                             |
| RAF Alconbury        |                             |
| Ramstein AB          |                             |
| Seymour Johnson AFB  |                             |
| USAF Academy         |                             |
| Wright-Patterson AFB |                             |