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PERFORMANCE SPECIFICATION

Back Automatic Parachute (BA-X) – Bailout & Ejection



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1. Scope

1.1. Introduction

This specification establishes the performance and test requirements for a high speed and ejection, back-automatic parachute (BA-X). The BA-X will replace current emergency back style parachutes which cause muscular and skeletal issues in both seated and standing aircrew because of excessive bulk and weight. The BA-X will be worn by aircrew during walk around applications on the B-52 as well as by seated personnel in ejection seats. The BA-X shall be a complete emergency bailout and ejection parachute system to include the features and accessories identified in Section 3 of this document.

The BA-X will be utilized in bailout, constant wear, static line, and ejection parachute applications for all B-52 aircrew during flight in war and peace time. Additional parachutes will be stored until needed. All the parachutes, to include those worn during flight, shall remain inside the aircraft, storage facility, or ejection seat until they are due for inspection as defined in Section 3 or need to be used.

1.2. Document Overview

The BA-X requirements and verification methods are specified in Section 3 and 4 below. Within the system characteristics and requirements section, “shall” denotes a mandatory level of performance.

Performance specification requirements are defined in this document within the context of their threshold and/or objective values. Thresholds and objectives, as designated within brackets in the individual requirements ([T] and [O] respectively), are upper and/or lower values that define a criterion’s acceptable performance range and provide the designer with allowable trade space that can be used during the development process. If not specified otherwise, requirements are considered to be thresholds. This trade space (i.e., the capability range between the threshold and objective) allows the systems engineering activities to flow without interruption. A performance threshold identifies the minimum acceptable value that, in the government’s judgment, is required to satisfy a need of the program. If performance threshold values are not achievable, program performance may be seriously degraded, and the utility of the system may become questionable. A performance objective is identified as the value desired by the user. It represents an incremental, operationally meaningful, time-critical, and cost-effective improvement to the threshold value to be viewed by government evaluators as a significantly value-added achievement to ultimate system performance, cost savings, and risk reduction. An objective value may be the same as the threshold when the achievable performance increase above the threshold is not quantitatively significant, operationally important, or useful. In addition, specifications identified with an asterisk (*) are considered Key Performance Parameters (KPPs).

2. Applicable Documents

2.1. General

The documents listed in this section are specified in sections 3, 4, or 5 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements of documents cited in sections 3, 4, or 5 of this specification, whether or not they are listed.

2.2. Government Documentation

2.2.1. Government Specifications, Standards and Handbooks.

The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

DEPARTMENT OF DEFENSE STANDARDS

MIL-STD-129R	Military Marking for Shipment and Storage
MIL-STD-130N	Identification Marking of US Military Property
MIL-STD-461F	Requirements for the Control of Electromagnetic Interference Characteristics of Subsystems and Equipment
MIL-STD-464C	Electromagnetic Environmental Effects Requirements for Systems
MIL-STD-810G	Environmental Engineering Considerations and Laboratory Tests
MIL-STD-882E	DoD Standard Practice: System Safety
MIL-STD-2073E	Standard Practice for Military Packaging
MIL-DTL-7567C	Parachutes, personnel, detail manufacturing instructions for

(Copies of these documents are available online at <http://quicksearch.dla.mil> or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

2.2.2. Other Government documents, drawings, and publications

The following other Government documents, drawings, and publications form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

T.O. 14-1-1 (Reference)	USAF Aircrew Flight Equipment and Clothing and Equipment
T.O. 1B-52H-1	Flight Manual, USAF Series B-52H Aircraft
FAR 25-853, Appendix F	Federal Aviation Regulation – Airworthiness Standards
DOD Instruction 5000.02	Operation of the Defense Acquisition System
TSO-C23f	Technical standard Order for Personal Parachute Assemblies

(TSO-C23f available from http://rgl.faa.gov/Regulatory_and_Guidance_Library/)

2.3. Non-Government Publications

Parachute Industry Association

PIA TS 135	Performance Standards for Personnel Parachute Assemblies and Components
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(Copies of these documents are available for purchase from <http://www.pia.com/>)

SAE International

AMS-STD-595A	Colors Used in Government Procurement
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(Copies of these documents are available for purchase from <https://www.sae.org>)

2.4. Order of Precedence

In the event of a conflict between the text of this document and the applicable documents cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. System Requirements

3.1. Workmanship

The workmanship employed in the manufacture of all parts and assemblies shall be of the highest quality and shall conform with MIL-DTL-7567C.

3.1.1. Material Age

The contractor shall select new materials not more than 3.5 years old (based on date of manufacture) of good quality that are capable of meeting all of the operational and environmental requirements specified herein.

3.1.2. Defects

There shall be no defects which might affect function or appearance.

3.1.3. Cleanliness

The finished assemblies and all integral parts shall be clean and free of oils and any other materials that might adversely affect their operations.

3.1.4. Edges

All excess flash shall be properly trimmed with all metal and plastic parts smooth and free of sharp edges.

3.2. FAA Certification*

The parachute system shall be TSO certified to the latest FAA standards stated in TSO-C23f.

3.3. Recycled, Recovered, or Environmentally Preferable Materials

Recycled, recovered, or environmentally preferable materials may be used wherever possible provided that the material meets or exceeds new material specifications, meets or exceeds the operational and maintenance requirements, and promotes economically advantageous life cycle costs.

3.4. Integration

The BA-X shall properly integrate with Aircrew, Aircrew Flight Equipment and Aircraft.

3.4.1. Aircrew

3.4.1.1. Aircrew Weight*

The BA-X shall accommodate aircrew and gear with a gross weight (total exit weight including all gear and the parachute) range of 120 to 300 pounds [T]; 107 to 350 pounds [O].

3.4.1.2. Anthropometric Characteristics

The BA-X shall accommodate Multivariate Population Cases 1-9 identified in Table 1 [T]. Shall accommodate 100% of aircrew members [O]. Case dimensions drawn from Table 5 of ENFC-CSB-08-01 (Change 1).

Table 1. Multivariate Cases for COTS

(dimensions in inches)	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6	Case 7	Case 9
	Small	Medium build Short	Medium build Long	Tall Sitting Height Short	Overall Large	Longest Limbs	Overall Small	Smallest Pilot
Thumb tip reach	27	27.6	33.9	29.7	35.6	36	26.1	30
Buttock-knee length	21.3	21.3	26.5	22.7	27.4	27.9	20.8	22.5
Knee-height sitting	18.7	19.1	23.3	20.6	24.7	24.8	18.1	20
Eye height sitting	32.8	35.5	34.9	38.5	40	38	31	34
Shoulder height sitting	20.6	22.7	22.6	25.2	26.9	25	19.5	21.8
Shoulder breadth range	14.7-18.1	16.4-20.6	16.2-21.2	16.8-21.7	16.9-22.6	16.8-22.5	14.2-18	16.4-20.6
Chest depth range	7.4-10.9	6.9-10.6	7.2-11.3	7.1-11	7.3-12.1	7.4-12.2	7.2-10.2	6.9-10.6
Thigh circumference range	18.5-25	17.1-25	20.2-27.6	17.6-26.3	18.6-29.2	19.1-29.7	17.8-25.2	17.1-25
Standing height	61.2	64.1	71.5	69	77	76.4	59.2	64
Nude Weight range	103 lbs to 245 lbs							

3.4.2. Aircrew Flight Equipment (AFE) Compatibility

The BA-X shall be compatible with and not degrade the performance of aircrew or standard AFE configurations IAW T.O. 14-1-1.

3.4.2.1. Hanging Harness

Shall not interfere with the aircrew member's performance of all necessary hanging harness procedures as specified in T.O. 14D1-2-1 with full equipment loads IAW T.O. 14-1-1.

3.4.2.2. Post Ejection

The BA-X shall integrate with the CNU-129/P survival kit and the survival kit actuator as well as the lap belt to enable safe activation after parachute deployment occurs.

3.4.2.3. Survival/Rescue Compatibility

The BA-X shall not interfere with or degrade the performance of any survival/rescue equipment or procedures.

3.4.2.4. Emergency OTH BCN Accessibility

The URT-46 Beacon shall be accessible by AFE technicians to where they do not affect the integrity of the pack to allow for battery and mode setting changes.

3.4.3. Aircraft Compatibility

The BA-X shall not degrade the safety, effectiveness, and performance of aircrew members in all crew duty stations in the B-52H, nor interfere with ingress/egress (including emergency ground) requirements.

3.4.3.1. Snagging Hazards

The BA-X shall minimize snagging hazards while worn by the crewmember in the aircraft.

3.4.3.2. Inadvertent actuation

Inadvertent actuation of the BA-X shall not cause an unsafe condition on the aircraft and shall not damage the aircraft.

3.4.3.3. Ejection Procedures

The BA-X shall not interfere with or degrade ejection procedures. The BA-X shall not prematurely come free of the seat until the aircrew-seat separation event and not hinder the other functions of the seat during ejection events. The BA-X shall conform with current ejection procedures in T.O. 1B-52H-1. The BA-X shall integrate with upward forward facing, upward rearward facing, and downward ejection seats during ejection events.

3.4.3.4. Harness/Safety belt Integration

The BA-X shall integrate with the harness release system, inertia reels, and the safety belt.

3.4.3.5. Seat Integration

The BA-X shall fit in the ejection seat cavity without causing unsafe pressure distributions on the aircrew's back/neck and remain properly positioned during all forms of normal and emergency operations. The BA-X shall not hinder aircrew while seated and strapped into the seat, as well as integrate with the man-seat separator, seat positioning switches, arm rests, release safety pins and integrated harness release handles.

3.4.3.6. Universal water activated release system (UWARS) integration

The BA-X shall integrate with the UWARS preventing it from being damaged during operation, when being installed or removed from the aircraft, and while left on the aircraft ready for use(prepositioned)

3.4.3.7. Gold Key Integration

The AAD gold key shall integrate with the lap belt and not interfere with any other components or hinder aircrew movement.

3.4.3.8. Static Line Integration

The BA-X shall allow for static line deployment of incapacitated aircrew members.

3.4.3.9. Field of View/Field of Regard

The BA-X, with LPU-38/P installed and while seated in the ejection seat, will not obstruct aircrew's vision panels, displays, etc.

3.4.3.10. Aircraft Mods

The BA-X will not require any aircraft modifications.

3.5. Physical Characteristics

3.5.1. System Donning

All aircrew shall perform BA-X donning unassisted in 20 seconds or less.

3.5.2. System Doffing

The BA-X shall be removed without assistance, separating the entire system from the crewmember in 10 seconds or less.

3.5.3. Inadvertent Function

The BA-X and the AAD (Automatic Activation Device) shall not inadvertently function nor shall secured points become unsecured during use within the conditions defined in this specification.

3.5.3.1. Windblast

The BA-X, including the AAD, shall not inadvertently function at ejection windblast speeds up to 400 KEAS, and bailout windblast speeds up to 275 KEAS.

3.5.4. Physical Constraints

3.5.4.1. Dimensions

The base BA-X configuration with AAD and all accessories shall not exceed 24" high by 14.5" wide by 4.4" thick [T]. The BA-X with AAD and all accessories shall not exceed 22" high by 14" wide by 4" thick [O].

3.5.4.2. BA-X Weight*

Weight of basic parachute equipped with AAD and excluding Oxygen bottle and PLD shall not exceed 22 lb [T], 17 lb [O].

3.5.4.3. Pack Color

The BA-X parachute for use in ejection shall be Coyote 498 IAW AMS-STD-595 ID 20150. The BA-X bunk parachute for use in bailout, walkaround, and static line shall be Gray 510 IAW AMS-STD-595 ID 26295.

3.5.4.4. Canopy Color

The BA-X canopy shall be color-coded in the sequence as follows:

- Approximately 36 percent international orange IAW AMS-STD-595, Color Number 12197; then
- Approximately 36 percent white IAW AMS-STD-595, Color Number 37875; then
- Approximately 14 percent sand shade IAW AMS-STD-595, Color Number 33303; then
- Approximately 14 percent olive green IAW AMS-STD-595, Color Number 34256.

3.5.4.5. Ripcord Pull Force

The ripcord pull force causing activation shall be a minimum of 15 lbf and a maximum of 22 lbf.

3.5.4.6. Ripcord Compatibility

The ripcords shall be compatible with freefall applications.

3.5.4.7. Ripcord Travel

The parachute activation sequence shall be initiated by a ripcord travel of 0.5 to 1.5 in.

3.5.4.8. Ripcord Handle Free Pull Distance

The Pull Distance the Ripcord Handle shall be able to be moved without causing Ripcord Travel is 1.5 to 3.0 in.

3.5.5. Ripcord Pin Protection

Ripcord pins shall be protected from bending.

3.5.6. Sizing Reference

The BA-X shall include sizing reference numbers, based on manufacturer sizing scheme, on adjustment webbing to aid in user fitting.

3.5.7. Parachute Automatic Release*

3.5.7.1. Time Delay

The BA-X AAD shall have a time delay that begins when the AAD activation handle is pulled and the below conditions are met.

3.5.7.1.1. Bailout Time Delay

The factory set bailout time delay shall be 5 seconds if bailout is accomplished below 14000 ft. If bailout is accomplished above 14000 ft the AAD shall prevent parachute activation until the altitude threshold is met.

3.5.7.1.2. Ejection Time Delay

The factory set ejection time delay shall be 0.75 seconds after man-seat separation if ejection is accomplished below 14000 ft via gold key. If ejection is accomplished above 14000 ft the AAD shall prevent parachute activation until the altitude threshold is met. The ejection variant shall have a separate AAD or a way to modify the time delay of the same AAD.

3.5.7.2. AAD Activation Altitude

Automatic activation shall be initiated after the time delay if altitude is less than or equal to 14,000 ± 1,000 ft MSL.

3.5.7.3. Working Temperature

The AAD shall operate correctly after being exposed to the following temperature range -65°F to 145°F (-54°C to 63°C).

3.5.7.4. AAD Service Life

The AAD shall have a service life of 15 years [T]; 20 years [O].

3.5.8. Personnel Lowering Device (PLD)

The BA-X shall have attachment points for the personnel lowering device, PCU-10/P, and future devices.

3.5.9. Accessory Components

The BA-X shall include D-rings for the attachment of a survival kit, ejector snaps for legs and chest, gold key attachment, Survival Kit Actuator, LPU D-Rings, LPU attachment zipper(2" below seam tape), an external pocket for optional use of MD-1 & 2 Bail Out Oxygen Bottles, stows or method of routing and securing oxygen hose from MD-1 & 2 Oxygen Bottles, and an external inspection data pocket to hold AFTO Form 391 (approximately 5" x 3" x 1/8", or folded in half will fit MS70094 pocket). The BA-X shall allow for positive inflation of the LPU when in the water and must be positioned in such a way that it keeps the crew member's head above water.

3.5.10. Lumbar Support/Back Pads/Seat Cushions

The BA-X shall include an attachment for lumbar support which will be offered as an optional accessory and back pads for comfort. The BA-X must integrate with current cushions on the B-52H.

3.5.11. Fitting

The BA-X shall require less than 5 minutes to adjust fitment to the user.

3.6. Egress Conditions

The BA-X canopy shall deploy correctly when initiated from all combinations of speed, altitude, aircrew weight and all other parameters provided in this specification.

3.6.1. Velocities*

The BA-X canopy shall deploy and inflate safely, IAW this specification when initiated within a velocity range of 85 to 280 knots equivalent airspeed (KEAS). The AAD in combination with user TTPs will ensure that the canopy is not deployed outside of this range. In the below sections opening refers to the speed of the aircrew and parachute when the canopy begins to deploy and aircraft refers to the speed of the aircraft at the moment of ejection initiation.

3.6.1.1. Bailout Velocity

Max bailout speed shall be 250 KEAS (opening).

3.6.1.2. Static Line Velocity

Max static line deployment speed shall be 250 KEAS (opening).

3.6.1.3. Ejection Velocity

Max ejection speed shall be 400 KEAS (aircraft) or 280 KEAS (opening).

3.6.2. Altitude*

The BA-X canopy shall deploy and inflate safely when initiated from the following altitudes measured sea level (MSL).

3.6.2.1. Bailout Altitude

Bailout from 500 ft to 14000 ft.

3.6.2.2. Ejection Altitude

Ejection from 0 ft to 14000 ft.

3.6.3. Rate of Decent*

The BA-X descent rate shall be no greater than 23 ft/sec [T], 21 ft/sec [O], at 350 lb gross weight and standard sea level conditions.

3.6.4. Canopy Collapse Prevention

Upon activation, the parachute canopy shall provide the proper rate of descent and not have a propensity to collapse.

3.6.5. Deceleration Force*

The peak deployment and inflation loads shall be no greater than 15 g at peak load.

3.6.6. Oscillation

The BA-X steady state descent oscillation shall not exceed $\pm 10^\circ$ from vertical for all weights in surface winds up to 15 mph.

3.6.7. Parachute Maneuverability

The system shall provide the crew member control over steering the parachute during descent equal to 10 degrees/sec [T], 20 degrees/sec [O].

3.6.8. Parachute Landing

Upon landing, the aircrew member must be able to disengage from the parachute risers using the quick release fittings.

3.7. Environmental Requirements

The context of “operate” as used in this section means to meet all the requirements of this specification without performance degradation.

3.7.1. Storage Temperatures

The BA-X shall remain structurally intact and meet the performance requirements of this document after exposure to storage temperatures from -65°F to 160°F (-54°C to 71°C) IAW MIL-STD-810G.

3.7.2. Operating Temperatures

The BA-X shall remain structurally intact and meet the performance requirements of this document during exposure to operating temperatures from -65°F to 145°F (-54°C to 63°C) IAW MIL-STD-810G.

3.7.3. Humidity

The BA-X shall remain structurally intact and meet the performance requirements of this document when exposed to a humidity levels up to 100% relative humidity IAW MIL-STD-810G.

3.7.4. Rain

The BA-X shall remain structurally intact and meet the performance requirements of this document when exposed to a rainfall rate of 4 inches per hour in a 40 mph wind.

3.7.5. Solar Radiation

The BA-X shall remain structurally intact and meet the performance requirements of this document when exposed to solar radiation at a rate of 1120 W/m² at 49°C (120°F).

3.7.6. Blowing Dust

The BA-X in storage configuration shall remain structurally intact and meet the performance requirements of this document after exposure to blowing dust.

3.7.7. Blowing Sand

The BA-X in storage configuration shall remain structurally intact and meet the performance requirements of this document after exposure to blowing sand.

3.7.8. Fungus

The BA-X shall be made of materials resistant to fungal growth.

3.7.9. Vibration

The BA-X shall operate after being exposed to the vibration environment of all MDSs listed in section 1.1.

3.7.10. Shock

The BA-X shall remain structurally intact and meet the performance requirements of this document after exposure to functional and transit shock.

3.7.11. Salt Fog

The BA-X shall withstand the effects of salt fog exposure, remain structurally intact and meet the performance requirements of this document after exposure.

3.7.12. Contamination by Fluids

The BA-X shall meet the performance of this specification with incidental contact with substances common to the military aviation environment and not be degraded.

3.7.13. Explosive Decompression

The BA-X shall withstand exposure to explosive decompression without damage or inadvertently activating.

3.7.14. Electromagnetic Interference and Compatibility

3.7.14.1. Susceptibility and Emissions

The BA-X, including the AAD, shall not be susceptible to damage or inadvertent actuation, nor emit electromagnetic radiation which will cause interference or malfunction of any aircraft component, instrument or control or any item stowed in the aircraft.

3.7.14.2. Electrostatic Discharge

The BA-X, including the AAD, shall withstand exposure to Electrostatic Discharge (ESD) without damage or inadvertently activating and continue to meet performance requirements after exposure.

3.8. Human Systems Integration

The BA-X shall be developed and designed with the human considered a primary system component. Operators, maintainers, sustainers, trainers, and other support personnel shall be considered in hardware selection and system construction to maximize performance in all settings. The BA-X shall allow for maximum flexibility, comfort, and protection for all aircrew members during all missions. The BA-X will conform with human factors engineering practices IAW MIL-STD-1472H.

3.9. Logistics

3.9.1. Reliability

The probability that the system shall meet its specified requirements over its service life shall be at least 0.98 at the 90 percent confidence level. This reliability is required in deployment and in opening, whether the parachute canopy is deployed automatically or manually.

3.9.2. Service Life

The BA-X, except for the AAD, shall be designed to have a service life (to include storage and operation) of 20 years [T], 25 years [O].

3.9.3. Interchangeability

The subsystems, components, and parts making up the system shall, be interchangeable with subsystems, components, and parts making up any BA-X.

3.9.4. Maintainability

3.9.4.1. Time between Scheduled Repacks*

The system shall meet reliability requirements with inspection or repack periods of 365 days [T], 730 days [O].

3.9.4.2. Mean Preventative Maintenance Time*

The maintainer shall be able to complete preventative maintenance actions (to include unpack, inspection, and repack) within 2 hours.

3.9.4.3. AFE Maintenance

The BA-X shall be designed to be fitted, repaired, and maintained by a maintenance concept (Organizational) by three and five level AFE specialists (AFSC 1P0X1) using a commercial manual. The manual shall be modified by the vendor to include ejection seat integration maintenance actions.

3.9.5. Training

The BA-X shall employ the “Train the Trainer” concept and shall not require additional time be added to AFE and Aircrew training pipelines to implement maintenance and use training.

3.10. Nameplates and Product Markings

The BA-X shall be appropriately identified with a unique identification (UID) that is globally unique and unambiguous IAW MIL-STD-130. Each separable component shall be marked per contract requirements with at least the following information: Part number, US Government contract number, Serial number, Date of manufacture, Manufacturer’s CAGE code, and Date placed in service area left blank.

3.11. Packaging, Handling, and Transportation

3.11.1. Transportation

Packaging of BA-X shall be suitable for transportation by air, land, and sea and shall also be capable of movement by theater distribution systems.

3.11.2. Package Marking

System and all components marking and bar code marking shall be IAW MIL-STD-129.

3.12. Environment, Safety, and Occupational Health (ESOH)

3.12.1. Safety

The BA-X shall be safe to operate, store, and maintain in its intended environment throughout its shelf and service life.

3.12.2. Safety and Health Hazard Management

The BA-X shall present no uncontrolled safety or health hazards during its shelf and service life.

3.12.3. Allergic Reaction

Materials shall be hypoallergenic and not cause allergic reaction or irritation of the user's skin.

4. VERIFICATION (Qualification Provisions)

This section specifies the verification requirements to qualify the BA-X in meeting all of the requirements in Section 3. Methods of verification are defined below.

Table 2. Verification Methods

I	Inspection	Verification without the use of special laboratory appliances or procedures. May include visual examination, simple physical manipulation, and/or mechanical and electrical gauging and measurement.
A	Analysis	Verification that utilizes established technical or mathematical models or simulations, algorithms, charts, graphs, or other scientific principles and procedures.
D	Demonstration	Verification that involves actual operation, adjustment, or reconfiguration of an item under specific scenarios. Items may be instrumented and quantitative limits of performance measured.
T	Test	Verification that involves thorough exercising of an item under specified conditions with instrumentation and data analysis accomplished IAW a set of applicable test procedures.

Table 3. Requirements Verification Traceability Matrix

KPP	Performance Paragraph	Requirement Description	Verification Method	Verification Paragraph
	3.1	Workmanship	I	4.1
	3.1.1	Material Age	I, A	4.1
	3.1.2	Defects	I	4.1
	3.1.3	Cleanliness	I	4.1
	3.1.4	Edges	I	4.1
*	3.2	FAA Certification	I	4.2
	3.3	Recycled, Recovered, or Environmentally Preferable Materials	A	4.3
	3.4	Integration	-	4.4
	3.4.1	Aircrew	-	4.4.1
*	3.4.1.1	Aircrew Weight	A, T	4.4.1.1
	3.4.1.2	Anthropometric Characteristics	I, A, D	4.4.1.2
	3.4.2	AFE Compatibility	I, D	4.4.2
	3.4.2.1	Hanging Harness	I, D	4.4.2.1
	3.4.2.2	Post Ejection	T	4.4.2.2
	3.4.2.3	Survival/Rescue Compatibility	D	4.4.2.3
	3.4.2.4	Emergency OTH BCN Accessibility	D	4.4.2.4
	3.4.3	Aircraft Compatibility	I, D	4.4.3
	3.4.3.1	Snagging Hazards	I, D	4.4.3
	3.4.3.2	Malfunctions	I, D	4.4.3
	3.4.3.3	Ejection Procedures	I, D	4.4.3
	3.4.3.4	Harness/Safety Belt Integration	I, D	4.4.3
	3.4.3.5	Seat Integration	I, D	4.4.3
	3.4.3.6	Universal Water Activated Release System (UWARS) integration	I, D	4.4.3
	3.4.3.7	Gold Key Integration	I, D	4.4.3
	3.4.3.8	Static Line Integration	I, D	4.4.3
	3.4.3.9	Field of View/Field of Regard	I, D	4.4.3

KPP	Performance Paragraph	Requirement Description	Verification Method	Verification Paragraph
	3.4.3.10	Aircraft Mods	I, D	4.4.3
	3.5	Physical Characteristics		4.5
	3.5.1	System Donning	D	4.5.1
	3.5.2	System Doffing	D	4.5.2
	3.5.3	Inadvertent Function	I, A	4.5.3
	3.5.3.1	Windblast	D, T	4.5.3.1
	3.5.4	Physical Constraints	-	4.5.4
	3.5.4.1	Dimensions	I	4.5.4.1
*	3.5.4.2	BA-X Weight	I	4.5.4.2
	3.5.4.3	Pack Color	I	4.5.4.3
	3.5.4.4	Canopy Color	I	4.5.4.4
	3.5.4.5	Ripcord Pull Force	D	4.5.4.5
	3.5.4.6	Ripcord Compatibility	D	4.5.4.6
	3.5.4.7	Ripcord Travel	D	4.5.4.7
	3.5.4.8	Ripcord Handle Free Pull Distance	D	4.5.4.8
	3.5.5	Ripcord Pin Protection	A	4.5.5
	3.5.6	Sizing Reference	I	4.5.6
*	3.5.7	Parachute Automatic Release	A, D, T	4.5.7
*	3.5.7.1	Time Delay	A, D, T	4.5.7
	3.5.7.1.1	Bailout Time Delay	T	4.5.7
	3.5.7.1.2	Ejection Time Delay	T	4.5.7
*	3.5.7.2	AAD Activation Altitude	A, D, T	4.5.7
*	3.5.7.3	Working Temperature	A, D, T	4.5.7
*	3.5.7.4	AAD Service Life	A, D, T	4.5.7
	3.5.8	Personnel Lowering Device	A, D	4.5.8
	3.5.9	Accessory Components	I, D	4.5.9
	3.5.10	Lumbar Support/Back Pads	I, D	4.5.10
	3.5.11	Fitting	I, D	4.5.11
	3.6	Egress Conditions	-	4.6
*	3.6.1	Velocities	T	4.6
	3.6.1.1	Bailout Velocity	T	4.6
	3.6.1.2	Static Line Velocity	T	4.6
	3.6.1.3	Ejection Velocity	T	4.6
*	3.6.2	Altitude	T	4.6
	3.6.2.1	Bailout Altitude	T	4.6
	3.6.2.2	Ejection Altitude	T	4.6
*	3.6.3	Rate of Decent	T	4.6
	3.6.4	Canopy Collapse Prevention	D, T	4.6
*	3.6.5	Deceleration Force	T	4.6
	3.6.6	Oscillation	A, T	4.6
	3.6.7	Parachute Maneuverability	A, T	4.6

KPP	Performance Paragraph	Requirement Description	Verification Method	Verification Paragraph
	3.6.8	Parachute Landing	T	4.6
	3.7	Environmental Requirements	T	4.7
	3.7.1	Storage Temperatures	T	4.7, 4.7.1
	3.7.2	Operating Temperatures	T	4.7, 4.7.2
	3.7.3	Humidity	T	4.7, 4.7.3
	3.7.4	Rain	T	4.7, 4.7.3
	3.7.5	Solar Radiation	T	4.7, 4.7.5
	3.7.6	Blowing Dust	T	4.7, 4.7.6
	3.7.7	Blowing Sand	T	4.7, 4.7.7
	3.7.8	Fungus	T	4.7, 4.7.8
	3.7.9	Vibration	T	4.7, 4.7.9
	3.7.10	Shock	T	4.7, 4.7.10
	3.7.11	Salt Fog	T	4.7, 4.7.11
	3.7.12	Contamination by Fluids	T	4.7, 4.7.12
	3.7.13	Explosive Decompression	T	4.7, 4.7.13
	3.7.14	Electromagnetic Interference and Compatibility	T	4.7, 4.7.14
	3.7.14.1	Susceptibility and Emissions	A, T	4.7, 4.7.14.1
	3.7.14.1	Electrostatic Discharge	A, T	4.7, 4.7.14.1
	3.8	Human Systems Integration	A, D	4.8
	3.9	Logistics	-	4.9
	3.9.1	Reliability	A, T	4.9.1
	3.9.2	Service Life	A, T	4.9.2
	3.9.3	Interchangeability	A, D	4.9.3
	3.9.4	Maintainability	-	4.9.4
*	3.9.4.1	Time Between Scheduled Repacks	A, D	4.9.4.1
*	3.9.4.2	Mean Preventative Maintenance Time	A, D	4.9.4.2
	3.9.4.3	AFE Maintenance	A, D	4.9.4.3
	3.9.5	Training	D	4.9.5
	3.10	Nameplates and Product Markings	I	4.10
	3.11	Packing, Handling, and Transportation	-	4.11
	3.11.1	Transportation	I, A	4.11.1
	3.11.2	Package Markings	I, A	4.11.2
	3.12	Environmental, Safety, and Occupational Health (ESOH)	-	4.12
	3.12.1	Safety	I, A	4.12.1
	3.12.2	Safety and Health Hazard Management	I, A	4.12.2
	3.12.3	Allergic Reaction	I, A	4.12.3

4.1. Workmanship

Sections 3.1.1 through 3.1.4 shall be verified by analysis of vendor drawings, data, material certifications, and by inspection.

4.2. FAA Certifications*

The vendor shall supply proof of FAA certification and test data.

4.3. Recycled, Recovered, or Environmentally Preferable Materials

Shall be verified by analysis of vendor design and/or material list(s) and certifications provided to the government.

4.4. Integration

4.4.1. Aircrew

4.4.1.1. Aircrew Weight*

Shall be verified by analysis and in conjunction with section 4.6 Egress Conditions.

4.4.1.2. Anthropometric Characteristics

Shall utilize fit mapping with human subjects and BA-X. The contractor shall use a representative population sample to determine compliance with Paragraph 3.4.1.

4.4.2. AFE Compatibility

Requirement shall be verified through inspection and demonstration with all listed MDSs in section 1.1 with standard AFE configurations IAW T.O. 14-1-1.

4.4.2.1. Hanging Harness

The hanging harness test shall be conducted using three subjects (minimum). The anthropometric body size range of the individuals shall be IAW (In Accordance With) section 4.5.1 System Donning. Test subjects shall be configured with the BA-X and AFE configurations identified in T.O. 14-1-1 and be suspended in a hanging harness. Each test subject shall demonstrate each configuration.

4.4.2.2. Post Ejection

A man seat separation test shall be performed using a dummy and all three variants of the ejection seat: upward front facing, upward rear facing, downward. The seat will be dropped from an aircraft with drogue chute pre-deployed to test for positive separation as well as survival kit, lap belt, and parachute actuator integration. The test shall be performed nine times total, once per seat with LOIS, LARD, and a JPATS Case 2 or Case 3 manakin.

4.4.2.3. Survival/Rescue Compatibility

A demonstration with SERE personnel shall verify that the BA-X can successfully integrate with survival/rescue CONOPs and TTPs.

4.4.2.4. Emergency OTH BCN Accessibility

A demonstration shall be performed with AFE personnel to verify that they can access the URT-46 beacon to make battery and mode selection changes without affecting BA-X integrity.

4.4.3. Aircraft Compatibility

Shall be verified through inspection and demonstration at all crew duty stations. Safety, effectiveness, and performance assessments shall be made during performance of mission duties

such as preflight, ingress, normal in-flight duties, emergency procedures, egress, and post-flight procedures utilizing aircraft qualified test subjects to validate compatibility and non-interference.

4.5. Physical Characteristics

4.5.1. System Donning

Donning shall be demonstrated using at least three subjects. Test subjects shall target Table 1 JPATS cases 2, 5, and 7. At least one subject shall be female. Test subjects shall don, without assistance, while wearing each AFE configuration in Table 3. Testing shall be accomplished in conjunction with section 4.6 Egress Conditions.

4.5.2. System Doffing

Doffing shall be demonstrated utilizing the same test subjects in the same ensemble types as specified in 4.5.1. Testing shall be accomplished in conjunction with section 4.6 Egress conditions.

4.5.3. Inadvertent Function

Shall be verified by analysis of design and inspection of final system. Data shall be collected during all other tests and from test subject survey.

4.5.3.1. Windblast

Shall be verified by demonstration and tests.

4.5.4. Physical Constraints

4.5.4.1. Dimensions

Shall be verified by inspection.

4.5.4.2. BA-X Weight

Shall be verified by inspection.

4.5.4.3. Pack Color

Shall be verified by inspection.

4.5.4.4. Canopy Color

Shall be verified by inspection.

4.5.4.5. Ripcord Pull Force

Shall be verified by demonstration.

4.5.4.6. Ripcord Compatibility

Shall be verified by demonstration.

4.5.4.7. Ripcord Travel

Shall be verified by demonstration.

4.5.4.8. Ripcord Handle Free Travel Pull Distance

Shall be verified by demonstration.

4.5.5. Ripcord Pin Protection

Shall be verified by analysis of design.

4.5.6. Sizing Reference

Shall be verified by inspection.

4.5.7. Parachute Automatic Release

Shall be verified by analysis and during parachute drop tests.

4.5.8. Personnel Lowering Device (PLD)

Shall be verified by analysis and demonstration.

4.5.9. Accessory Components

Shall be verified by inspection and demonstration.

4.5.10. Lumbar Support/Back Pads

Shall be verified by inspection and demonstration.

4.5.11. Fitting

Shall be verified by inspection and demonstration.

4.5.12. Survival Kit Actuator

Shall be verified by inspection and demonstration.

4.6. Egress Conditions

Parachute drop and jump tests shall be performed using torso manikins as well as full manikins on the low and high end of the anthropometric range (LOIS & LARD). They will be augmented with AFE such that the maximum weight tested shall be 350lbs and the minimum weight tested shall be 120lbs. 122 tests shall be conducted in total with 108 being done using dummies and the remaining 14 being performed by live jumpers. Data on BA-X oscillation in wind shall be verified by test data collected during Parachute drop/live jump testing. Maneuverability and landing shall be verified using live jumps. Verification of wind requirements outside of conditions experienced during testing shall be done by analysis. The BA-X can meet bailout requirements without meeting ejection requirements. Table 4 outlines the test matrix to be followed to validate requirements.

Table 4. Drop/jump test verification matrix

Drop	Testing	Altitude MSL (ft)	Deployment Speed (KEAS)	Method of Deployment	Weight (lbs)
1-8	Bailout & Static Line	4200	130	Static Line to T handle	120
9-16	Bailout & Static Line	4200	130	Static Line to T handle	350
17-24	Bailout & Static Line	4200	242	Static Line to T handle	120

Drop	Testing	Altitude MSL (ft)	Deployment Speed (KEAS)	Method of Deployment	Weight (lbs)
25-32	Bailout & Static Line	4200	242	Static Line to T handle	350
33-34	Bailout & Static Line	4200	250	Static Line to T handle	350
35-36	Bailout & Static Line	4200	250	Static Line to T handle	120
37-44	Bailout, Static Line & AAD	7000	85	Static Line to AAD	120
45-52	Bailout, Static Line & AAD	7000	130	Static Line to AAD	350
53-60	Bailout, Static Line & AAD	7000	242	Static Line to AAD	120
61-68	Bailout, Static Line & AAD	7000	242	Static Line to AAD	350
69-76	Bailout, Static Line & AAD	14000	85	Static Line to AAD	120
77-84	Bailout, Static Line & AAD	14000	130	Static Line to AAD	350
85-92	Bailout, Static Line & AAD	14000	242	Static Line to AAD	120
93-100	Bailout, Static Line & AAD	14000	242	Static Line to AAD	350
101-114	Maneuverability & Landing	7000	130	Manual	220
115	Ejection	4200	260	T handle	350
116	Ejection	4200	260	T handle	120
117	Ejection	4200	280	T handle	350
118	Ejection	4200	280	T handle	120
119	Ejection	14000	260	T handle	350
120	Ejection	14000	260	T handle	120
121	Ejection	14000	280	T handle	350
122	Ejection	14000	280	T handle	120

4.7. Environmental Conditions

The BA-X shall be subjected to the environmental tests described in the following sections. Testing shall use the same articles for multiple Environmental Conditions tests to demonstrate BA-X environmental resistance. Individual tests, as well as combinations of some environmental tests,

could influence subsequent testing. Therefore, guidance for test sequence identified in Paragraph 2.1.2 of each Test Method in MIL-STD-810G shall be strictly adhered to.

The BA-X shall be visually inspected for any damage and degradation immediately prior to and immediately following each test. The BA-X shall not inadvertently function during any environmental test. BA-X systems shall be subjected to jump tests of 4.6 at the conclusion of Environmental Conditions testing. The BA-X shall function within performance specification requirements following Environmental Conditions testing. Results from testing on Environmental Conditions test articles shall be compared to test articles not subjected to Environmental Conditions testing to document any resulting physical damage and/or functional degradation.

Environmental test requirements for the BA-X may be met by similarity to the existing Air Force back style parachute.

4.7.1. Storage Temperatures

The BA-X in its packed configuration for storage shall be tested IAW MIL-STD-810G, Method 501.6, High Temperature, Procedure I. The BA-X shall be subjected to a non-operating (storage) high temperature cycle exposure of 91°F to 160°F using the temperature and relative humidity conditions per Table 501.6-III, High temperature cycles, climatic category A1 – Hot Dry (Induced Conditions), for seven 24 hour cycles.

The system shall be subjected to low temperature IAW MIL-STD-810G, Method 502.6 Low Temperature, Procedure I. Exposure duration shall be 72 hours minimum at -65°F (-54°C).

4.7.2. Operating Temperatures

The BA-X in its operational configuration shall be tested IAW MIL-STD-810G, Method 501.6, High Temperature, Procedure II. The temperature profile shall be constant at 145°F (63°C).

The BA-X in its operational configuration shall be tested IAW MIL-STD-810G, Method 502.6, Low Temperature, Procedure II. The temperature profile shall be constant at -65°F (-54°C).

4.7.3. Humidity

The system shall be subjected to humidity IAW MIL-STD-810G, Method 507.6, Procedure II. The BA-X shall be exposed to ten 24-hour cycles IAW, Figure 507.6-7, Aggravated temperature-humidity cycle.

4.7.4. Rain

The system shall be subjected to rain IAW MIL-STD-810G, Method 506.6, Procedure I or equivalent. Rain exposure shall be 4 inches per hour with a 40 mph wind.

4.7.5. Solar Radiation

The system shall be subjected to solar radiation IAW MIL-STD-810G, Method 505.6, Procedure II. Test duration shall be ten 24 hour cycles with an irradiance intensity of 1120 ± 47 W/m² at 120°F (49°C) with 4% relative humidity.

4.7.6. Blowing Dust

The system shall be subjected to blowing dust IAW MIL-STD-810G, Method 510.6, Procedure I. Air velocities shall be 8.9 m/s (1750 ft/min). Test article shall be set-up on a test manikin and worn as if in an operational environment. Red china clay shall be the dust composition. Particle

concentration shall be maintained at 10.6 ± 7 g/m³ (0.3 ± 0.2 g/ft³) for the duration of the test. Particle size distribution shall be 100% by weight less than 150 μ m. In order to simulate the effects of multidirectional winds, the test item shall be rotated at 90 minute intervals to expose all faces (top, bottom, and all four sides) to the test environment. Test duration shall be nine hours at 23°C and an additional nine hours at 71°C. Humidity shall be kept at or below 30% relative humidity for the duration of the test.

4.7.7. Blowing Sand

The system shall be subjected to blowing sand IAW MIL-STD-810G, Method 510.6, Procedure II. Air velocities shall be 18 to 29 m/s (3540 to 5700 ft/min). Test article shall be set-up on a test manikin and worn as if in an operational environment. Silica sand (at least 95% by weight SiO₂) shall be used for the test. The particle size distribution shall be from 150 μ m to 850 μ m, with a mean of $90 \pm 5\%$ by weight smaller than 600 μ m and larger than 149 μ m, and at least 5% by weight 600 μ m and larger. In order to simulate the effects of multidirectional winds, the test item shall be rotated at 90 minute intervals to expose all faces (top, bottom, and all four sides) to the test environment. Test duration shall be nine hours at 71°C. Humidity shall be kept at or below 30% RH for the duration of the test.

4.7.8. Fungus

The system shall be subjected to fungus IAW MIL-STD-810G, Method 508.7. Test duration shall be 84 days. Either the U.S. fungus group (Table 508.7-I) or European fungus group (Table XXIII), as identified in MIL-STD-810G, shall be utilized for the test. If the U.S. fungus group is used, one type fungus from the European fungus group, *Scopulariopsis brevicaulis*, shall be added to the test group. Following visual inspection for damage, the BA-X shall be cleaned after testing to demonstrate the reversal effects of fungus removal. The BA-X shall be resistant to fungal growth, withstand the effects of fungus, remain structurally intact and meet the performance requirements of this document during and after exposure. Signs of fungal growth shall be evaluated and reported using Table 508.7-II from MIL-STD-810G.

4.7.9. Vibration

The system shall be subjected to operating vibration IAW MIL-STD-810G, Method 514.7. Conduct vibration testing after and on the same test article used for high and low temperature testing to evaluate cumulative effects. All BA-X configurations shall undergo Test Category 4 - Test Procedure I, Test Category 7 - Test Procedure I, Test Category 8 - Test Procedure I, Test Category 12 - Test Procedure I, Test Category 13 - Test Procedure I, and Test Category 14 - Test Procedure I. The BA-X shall also undergo gunfire vibration testing IAW MIL-STD- 810G, Method 519.7. The BA-X shall undergo a B-52H platform specific vibration test using a spectrum the BA-X is likely to encounter in operational use. Materiel is deemed to have failed if it suffers permanent deformation or fracture; if any fixed part or assembly loosens; if any moving or movable part of an assembly becomes free or sluggish in operation; if any movable part or control shifts in setting, position or adjustment, and if test item performance does not meet specification requirements while exposed to functional levels and following endurance tests.

4.7.10. Shock

The BA-X shall be tested IAW MIL-STD-810G Method 516.7, Procedure I (Functional Shock), IV (Transit Drop), Procedure V (Crash Hazard), and Procedure VI (Bench Handling). For Procedure IV, the BA-X shall be dropped different ways at height of six feet. Shock testing shall be done after and on the same test item used for vibration testing.

4.7.11. Salt Fog

The BA-X shall be subjected to salt fog IAW MIL-STD-810G, Method 509.6 . The test shall consist of a minimum of four alternating 24-hour periods of salt fog exposure and drying conditions (two wet and two dry). Test chamber temperature shall be maintained at $35 \pm 2^{\circ}\text{C}$. A 5% $\pm 1\%$ salt solution concentration shall be used with a fall-out rate such that each receptacle collects 2 ± 1 ml of solution per hour for each 80cm² of horizontal collection area (10cm diameter).

4.7.12. Contamination by Fluids

The BA-X shall be subjected to chemical testing IAW MIL-STD-810G, Method 504.2, Procedure I, intermittent contamination option. In addition to the fluids listed in Table 504.2-I of MIL-STD-810G, the following contaminants shall be tested: MIL-H-82382 hydraulic fluid, and MIL-L-7808 aircraft engine lubricant. Test lubricant temperatures shall be as listed in Table 504.2-I. Test item temperature shall be $52^{\circ}\text{C} \pm 2^{\circ}\text{C}$ ($125^{\circ}\text{F} \pm 3.6^{\circ}\text{F}$). The BA-X shall be visually and functionally checked immediately after the chemical profile and results shall be compared with pretest data. Following testing, the test item shall be stored for a period of 30 days and then visually and functionally tested to evaluate the long term effects of exposure to chemicals.

4.7.13. Explosive Decompression

Explosive decompression testing shall be IAW MIL-STD-810G, Method 500.6, Procedure IV. The BA-X shall not inadvertently function during decompression. The BA-X shall be visually inspected for damage following testing.

4.7.14. Electromagnetic Interference and Compatibility

4.7.14.1. Susceptibility, Emissions, and Electrostatic Discharge

The system shall be tested IAW MIL-STD-461 Paragraphs 5.16 to 5.21.

4.8. Human Systems Integration

Shall be verified by demonstration and analysis.

4.9. Logistics

4.9.1. Reliability

Verification of mission reliability shall be calculated through analysis using USAF jump tests and FAA certification.

4.9.2. Service Life

The service life shall be verified through accelerated service life testing and environmental test data. The test shall simulate the forces acted on it during unpacking/repacking for the equivalent of 25 years. This will be performed by unpacking/repacking the parachute 25 times and then subjecting it to environmental tests IAW 4.7. After the accelerated test, the BA-X and all of its components shall show no signs of cracking, corrosion, thermal degradation, delamination, or wear and shall remain structurally intact and meet the performance requirements of this specification.

4.9.3. Interchangeability

Shall be verified by analysis of designs and maintenance demonstrations.

4.9.4. Maintainability

4.9.4.1. Time between Scheduled Repacks

Shall be verified through reliability analysis and maintenance demonstrations.

4.9.4.2. Mean Preventative Maintenance Time

Shall be verified through reliability analysis and maintenance demonstrations.

4.9.4.3. Commercial Manual

Shall be verified by demonstration and analysis of technical data.

4.9.4.4. AFE Maintenance

Shall be verified by demonstration and analysis of technical data.

4.9.4.5. Spare Parts

Shall be verified by analysis of technical data.

4.9.5. Training

Shall be verified through demonstration using the “Train the Trainer” concept to ensure AFE technicians as well as aircrew members can be taught how to maintain and use the BA-X without having to increase current training pipeline durations.

4.10. Nameplates and Product Markings

Shall be verified by inspection of drawings and hardware.

4.11. Packaging, Handling, and Transportation

4.11.1. Transportation

Shall be verified by analysis and inspection of drawings.

4.11.2. Package Marking

Shall be verified by analysis and inspection of drawings.

4.12. Environment, Safety, and Occupational Health (ESOH)

4.12.1. Safety

Shall be verified through inspection and analysis.

4.12.2. Safety and Health Hazard Management

Shall be verified by inspection and analysis.

4.12.3. Allergic Reaction

Shall be verified by inspection and analysis.

5. PACKING, HANDLING, STORAGE AND TRANSPORTATION

5.1. Packing

Unless otherwise specified in the contract, systems, components, and parts to be delivered shall be preserved and packaged in a manner that will afford adequate protection against corrosion, deterioration, and physical damage during shipment from the supply source to the first receiving activity. The level of preservation and packaging in general shall conform to the uniform freight

classified rules or other applicable carrier rules, and may be the supplier's commercial practice when such meets the requirements of this level.

5.2. Labeling

All containers shall be tagged or labeled to identify and quantify the items and indicate dates of acquisition. The internal sealed bag shall be marked as a unit pack in accordance with MIL-STD-129, MIL-STD-130, and the DoD Guide to Uniquely Identifiable Items, and the outer fiberboard shipping container shall also be marked in accordance with MIL-STD-129. Minimum information to be included on both the internal sealed bag and the outer shipping container shall be: National Stock Number, Noun, Serial Number, Part Number, Unit of Issue, Unique Identification Code, and Quantity, Manufacturer CAGE Code, Contract Number, Date Packed, and "Warranted Item."

5.3. Shipment Marking

All shipping containers shall be tagged or stamped with all the marking necessary for delivery and storage, all markings required by regulations, statutes and common carriers, and all markings necessary for safety and safe delivery.

6. Notes

6.1. Special Definitions

The following provides definitions for terms unique to this specification:

AGL	Above Ground Level
AAD	Automatic Activation Device
BA-X	Back-Automatic Parachute
CBRN	Chemical, Biological, Radiological, Nuclear
EMP	Electromagnetic Pulse
ESD	Electrostatic Discharge
IAW	In Accordance With
KEAS	Knots Equivalent Airspeed
NBC	Nuclear, Biological, and Chemical
NVG	Night Vision Goggle
PLD	Personnel Lowering Device
UID	Unique Identification
GSA	Government Services Administration
DLA	Defense Logistics Agency
SBSS	Standard Base Supply System
AFEMS	Air Force Equipment Management System

