

# **Parachute Industry Association Publications**

## **PIA Technical Standard 120 2.01**

### **AAD Design and Testing Report Format**

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TS-120 2.01

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## 1. Objective

The PIA AAD Design & Testing Report Format is regarded as fulfilled when the manufacturer releases the following test report about his product.

The test report will be published by the PIA in the "Para NewsBrief", and on the PIA Internet Web Site so that the public has access to it.

With the following report procedure, every manufacturer has their own choice to define the extent and kind of requirements concerning their particular unit. The requirement regarding quality of each product results from the self-defined test requirements. Each manufacturer is free to decide which of the actual tests and quality control parameters they want to use in the published test report.

The self-chosen quality requirements should be documented.

The form of the description should follow a general format. In each section, the manufacturer should describe:

- the goal of the test, e.g. recognizing of the correct activation altitude, checking of correct function under elevated temperatures, etc.
- how many units have been utilized to perform the test in question
- the test arrangement
  - what has been measured/tested?
  - how has it been measured/tested?
  - what test equipment has been utilized?

Each test report shall contain references to all sections, even if they are "not recommended". All sections should be listed even when no data is presented. In this case a statement such as "not applicable", "not recommended", "not appropriate", "not valid", or "no statement on this point" should be included. In the event there is no reference to any particular section, the Para NewsBrief Editor will include the missing section with the notation "no statement supplied by the manufacturer" prior to publishing the report.

## 2. Reference documents

MIL-STD-810E	Environmental Test Methods
MIL-STD-45662A	Calibration System Requirements
RTCA/DO-160C	Environmental Conditions and Test Procedures
MIL-STD-331B	Procedure C1 for Temp. & Humidity Test
RTCA/DO-178B	Software considerations in Airborne Systems and Equipment Certifications
MIL-STD-461D	Requirements of the Control of Electromagnetic Interference, Emissions and Susceptibility

### **3. Design description**

#### **3.1. Specific usage modes of the device** *(recommended)*

*a description for what purposes the device is suitable (or not suitable) e.g. is the unit designed for a particular usage, mode of operation, or user-type group (student, tandem, military, etc.)*

#### **3.2. Principle of operation** *(recommended)*

*a description of how the unit comes to the decision to activate and how the life saving device is activated (in the case of a main or reserve parachute, by what means is the parachute activated?)*

#### **3.3. Technical data** *(recommended)*

*Complete technical description including (but not limited to):*

- list of components or subsystems*
- dimensions*
- weight*
- volume*
- storage conditions*
- operating conditions (temp / relative humidity)*
- life time of consumptive components (batteries, sensors, filters, springs, antenna, etc.)*
- activation parameters*
- accuracy*
- reliability (statistical value)*
- service interval*

#### **3.4. Limitations** *(recommended if appropriate)*

*examples:*

- if the unit is not suitable for certain parachuting activities*
- if the unit is only suitable for specific operations*
- if unusual basic operating conditions are required*

*Typical questions which may arise here:*

- Can the unit be used when take-off and landing sites are at different locations or altitudes?*

- *Can it be used for high altitude jumps?*
- *Can it be used for water jumps (salt / fresh water)?*
- *Can it be used when flying in pressurized aircraft?*
- *Can it be used at extreme speeds?*

**3.5. Preventive means of the device to minimize the affection of system or sub system failures** *(optional)*

- *means taken to recognize the failure of the whole system*
- *means taken to recognize the failure of a sub-systems*
- *is there an indicator for a failure?*
- *how are these precautions adequate to prevent a misfiring?*

## **4. Testing**

**4.1. General overview of the testing program** *(recommended)*

*Clear description of the testing system, goals, results, and after action.*

*Note: this section is very important. From the information given here conclusions can be derived concerning the probability of various problem areas in*

- *design*
- *development*
- *test*
- *production*
- *usage*

*It should be made clear that problems are recognized and that solutions lead to results. The exact details of specific solutions need not necessarily be explained, as often this is the proprietary knowledge of the particular manufacturer.*

#### **4.2. Altitude measurement subsystem** *(recommended)*

*which procedure is utilized to establish altitude:*

- freefall time*
- air pressure (barometric)*
- air pressure (dynamic)*
- gyroscopic navigation*
- radio altimetric*
- other*

*which physical tests have been performed to check the function of this subsystem?*

*what is the functional principle of the measurement apparatus?*

*which data basis has been used for the functional testing and/or simulation?*

#### **4.3. Release subsystem** *(if appropriate)*

*This section needs to be completed if a main or reserve parachute is used for the life saving action and therefore have to be released. The principle of operation of the subsystem should be described here with the specific requirements of the tests.*

*If a completely independent system for the saving action is used, "not applicable" should be used here.*

*Include if applicable: Required force of the activation sub system? (i.e. spring pull: what force has to be achieved?) Are any special materials necessary such as loops, special closing pins, etc.?*

#### **4.4. Complete system test**

##### **4.4.1. Installation and function** *(recommended)*

*Description of how the basic installation in / on a parachute container is performed.*

*What has been checked to verify proper integration and interaction of the parachute system and the AAD system?*

*What has been done to avoid interference with the other portions and material of the parachute system? What particular instructions to users and riggers have resulted from this?*

*Are any specific materials or tools required, or is there a special "installation service station"?*

#### **4.4.2. Drop tests** (optional)

*How many jumps with how many different units, under which conditions, with which goals have been performed?*

*Results could be presented in a simple form (judgment of good, satisfactory, etc.) or in a more extensive form (tables with measurement results, etc.).*

*Questions which could be answered by a reasonable number of drop tests are:*

- how does the system cope with unstable freefall?*
- how does the system react to a cutaway?*
- how does the system react to different freefall velocities?*
- how does this system react to various stable freefall positions?*

#### **4.4.3. Live jumps** (optional)

*How many live jumps with how many different units, under which conditions, with which goals have been performed?*

*Results could be presented in a simple format (judgment of good, satisfactory, etc.) or in a more extensive form (tables with measurement results, etc.).*

*Questions which could arise here are:*

- is the tests series comprehensive enough?*
- were extreme climatic conditions considered?*
  - e.g. how does the system react*
    - to strong thunderstorms?*
    - to high humidity?*
    - to high / low temperatures?*

### **4.5. Environmental testing**

#### **4.5.1. Shock** (recommended)

*Refer to the comprehensive procedures in:*

*MIL-STD-810E      Environmental Test Methods, Method 516.4*

*RTCA/DO-160C      Environmental Conditions and Test Procedures, Section 7*

*It is highly desirable that the tests are performed in accordance with these or similar procedures*

*The report should include a description of the procedures and the results.*

#### **4.5.2. Vibration** (recommended)



*Refer to the comprehensive procedures in:*

*MIL-STD-810E Environmental Test Methods, Method 514.4*

*RTCA/DO-160C Environmental Conditions and Test Procedures, Section 8*

*It is highly desirable that the tests are performed in accordance with these or similar procedures*

*The report should include a description of the procedures and the results.*

#### **4.5.3. Humidity** *(recommended if appropriate)*

*Note: if in section 3.3 specific humidity rangers are not excluded, some consideration should be given here in regard to condensing / not condensing, rain, submersion, etc.*

*Refer to the comprehensive procedures in:*

*MIL-STD-810E Environmental Test Methods, Method 507.3, 508.4, 506.3, 520.1*

*RTCA/DO-160C Environmental Conditions and Test Procedures, Section 6, 10, 24*

*MIL-STD-331B Procedure C1 for Temp. & Humidity Test*

*It is highly desirable that the tests are performed in accordance with these or similar procedures*

*The report should include a description of the procedures and the results.*

#### **4.5.4. Salt** *(recommended if appropriate)*

*Refer to the comprehensive procedures in:*

*MIL-STD-810E Environmental Test Methods, Method 509.3*

*RTCA/DO-160C Environmental Conditions and Test Procedures, Section 14, 24*

*MIL-STD-331B Procedure C1 for Temp. & Humidity Test*

*It is highly desirable that the tests are performed in accordance with these or similar procedures*

*The report should include a description of the procedures and the results.*

#### **4.5.5. Temperature** *(recommended)*

*Testing should be performed at least in the range which is defined in section 3.3. as allowed*

*Refer to the comprehensive procedures in:*

*MIL-STD-810E      Environmental Test Methods, Method 501.3 ... 503.3, 520.1*

*RTCA/DO-160C      Environmental Conditions and Test Procedures, Section 4, 5, 24*

*It is highly desirable that the tests are performed in accordance with these or similar procedures*

*It is important to know if a classification according RTCA/DO-160C had been made*

*The report should include a description of the procedures and the results*

#### **4.5.6. Software** *(recommended if appropriate)*

*Corresponding portions of RTCA/DO 178B*

*In which software level (A ... E) has the software been classified*

*Description of the quality control methodology used in*

- software design (RTCA/DO 178B, chapter 4.1 ... 4.6)*
- software programming (RTCA/DO 178B, chapter 5.1 ... 5.5)*
- software testing (RTCA/DO 178B, chapter 6.1 ... 6.4)*
- software documentation*
- software validation (RTCA/DO 178B, chapter 9.1 ... 9.4)*
- software controls during production phase (RTCA/DO 178B, chapter 7.1 ... 7.3)*
- software design change testing and validation (RTCA/DO 178B, chapter 11.1 ... 11.20)*

*to achieve the desired quality level*

#### **4.5.7. EMI / EMS / ESD** *(recommended if appropriate)*

*corresponding portions of MIL-STD-461D and RTCA/DO-160C, section 15 and 19 ... 22)*

*With electronic units it should be assumed that the electromagnetic environment is extremely aggressive. At the same time consideration should be made to possible interference with airborne avionics.*

*In particular, the points to be considered are:*

- passive susceptibility (radiated, conducted, electrostatic)*
- active radiation*

*Which portions of the spectrum at what power levels have been tested? Which frequencies in particular have been tested separately?*

- *magnetic*
- *electro magnetic*

*What electrostatic discharge levels is the unit compatible with at various entry points?*

#### **4.5.8 Aging test** *(optional)*

*What tests have been conducted with which results in order to formulate a statement about the expected life time of the unit?*

*Refer to the procedures in MIL-STD-331B, Procedure C1*

#### **4.5.9. Other** *(optional)*

*e.g. environmental test for sand and dust, see RTCA/DO-160C, Section 12*

## **5. Human Interface**

### **5.1. Arm / Disarm** *(recommended if appropriate)*

*How, when, where is the unit to be armed / disarmed? (An excerpt from the Operation Instructions could be useful here.)*

### **5.2. User calibration** *(recommended if appropriate)*

*Description of when and how the unit needs to be calibrated? (An excerpt from the Operation Instructions could be useful here.)*

### **5.3. Parameter changes** *(recommended if appropriate)*

*Description of how particular functioning parameters can be changed, if possible. For instance: Setting / changing of:*

- *activation altitude*
- *activation velocity*
- *freefall time*
- *activation delay*
- *(other)*

**6. Marking / Labeling** *(recommended)*

*Description of the unit marking and labeling. At minimum, samples should be presented along with a description of the various portions. (Serial number, part number, date of manufacture, etc.)*

**7. Documentation** *(recommended)*

- *copy of Operator's manual / user documentation*
- *copy of any installation / rigging instructions or documentation*
- *(optional), copy of any servicing documentation*
  - *complete list of available documentation*
  - *list of languages in which these documents are available*

**8. Maintenance**

**8.1. Field maintenance** *(recommended if appropriate)*

*description of periodic inspection or testing which can or must be made "in the field". (at every repack, after contact with water, etc.)*

**8.2. Manufacturer maintenance** *(recommended if appropriate)*

- *periodic maintenance cycle*
- *other times factory maintenance required: after specific conditions, mis-use, etc.*
- *(optional), what are the specific procedures, what is replaced, how long does the maintenance procedure take, what are the estimated costs?*

**8.3. Service stations** *(recommended if appropriate)*

*which maintenance procedures can be performed at (factory authorized) service stations?  
(optional) list of factory authorized service stations*

## **9. Quality Control Procedures/Systems and Methodology**

### **9.1. Purchased parts / components** *(optional)*

- *are all part suppliers ISO 9000 certificated?*
- *are the components used of: consumer, industrial, military, or other grade/quality specification?*

### **9.2. Production** *(optional)*

- *is the manufacturer ISO 9000 certificated?*
- *are subcontractors ISO 9000 certificated?*
- *is a quality control manual available?*
- *is the quality of every unit recorded?*

### **9.3. Final testing** *(optional)*

- *is 100% or statistical sampling tests performed? (what sampling method?)*
- *what is being tested in detail?*
- *describe any tests performed that ensure each unit produced meets the performance standards of the original design.*
- *what testing records are retained for each unit?*

### **9.4. In the field** *(optional)*

*What means are available to monitor or control the quality in the field? (Capability of functioning, precision, accuracy, etc.)*

## **10. Additional remarks**

*Any additional items that the manufacturer wishes to disclose concerning the unit*

*(background, operation, usage, testing, etc.).*