

Aviacom SA/ NV

Argus

-Automatic Activation Device-

Design and Test Report

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Argus AAD Design and Test Report

1. Objective

This report defines the testing procedures of the Argus AAD, according to the AAD Design and Testing Report Format of the PIA, PIA Technical Standard 120 2.01.

The objective of these tests is to measure the functionality and reliability of the Argus Automatic Activation Device. The report documents all relevant tests for an AAD such as, but not limited to, temperature, humidity, vibration, pressure changes, electromagnetic interference(s) and Electrostatic Discharge(s).

- All methods and equipment used for these tests are described.
- All tests are documented.

2. Reference documents/testing

The Argus has been tested in Belgium by De Nayer Laboratories (formerly Alcatel-Bell) and the University of Liège.

All climate and environmental tests were performed by De Nayer Laboratories (Appendix 1). All calibrations of the test cabinets are done according to all relevant EC calibration norms, regulations and procedures.

The EMC (Electromagnetic Compatibility) and ESD (Electrostatic Discharge) testing has been performed by Laboratory De Nayer, section:

- EMC, accredited by Beltest for EMC immunity and EMC-emission under registration number 053-T.
- ESD, Accredited by Beltest for EMC immunity and EMC-emission under registration number 053-T.

Reference documents:

- EN 61000-4-3 (1995): Radiated radio frequency electromagnetic compatibility (EMC) - Part 4: Testing and measurement techniques - Section 3: Radiated, radio-frequency electromagnetic field immunity test.
- ENV502040 (1995): Radiated electromagnetic field from digital telephones - immunity test.
- EN 61000-4-2 (1995): Electrostatic Discharge (ESD) Immunity Test.
 - Contact electrostatic discharge immunity
 - Air electrostatic discharge immunity
- EN 61000-4-2 VCP (1995): Contact Electro Discharge
- MIL-STD-331B (F- Electrostatic Discharge)
- MIL-STD-331B (C1- Temperature and humidity)
- MIL-STD810E (valid environmental tests)
- RTCA DO-160 (valid environmental tests)

3. General description of the product

3.1 Specific usage of the device

Argus SIS (sports version)

The Argus has four jump modes:

- Standard (intermediate>experienced parachutists)
- Novice (student, <intermediate)
- Tandem
- Swoop (highly experienced and with restrictions)

Jump Mode	Activation Altitude	Vertical Speed	Monitors jump until landing
Standard	250 m/ 820 ft	35m/s, 78mph	Yes
Swoop	250 m/ 820ft	35 m/s, 78mph	No
Novice	300 m/ 984ft	20 m/s, 45mph	Yes
Tandem	660 m/ 2160ft	35 m/s, 78mph	Yes

With the exception of the Swoop mode will all modes continue to monitor the jump after opening of the main canopy The Swoop mode will go into standby as has been detected that the main parachute is opened.

Argus TPM (military version)

The Argus TPM (time, pressure and multi mode) is designed for tactical military operations:

- High speed activation (training + operational)
- Low speed activation (training + operational)
- Tandem (training + operational)
- Time (operational)
- Pressure (operational)

Jump Mode	Activation	Vertical Speed	Monitors jump until landing
High	300 m/ 984ft	35m/s, 78mph	Yes
Low	300 m/ 984ft	20 m/s, 45mph	Yes
Tandem/ Bundle	660 m/ 2160ft	29 m/s, 65mph	Yes
Time	2 > 65 seconds	29 m/s, 65mph	Yes
Pressure	-500m/ -1640ft +15000m/ 49200ft	29 m/s, 65mph	Yes

3.2. Principle of operation

The Argus is a safety device for parachutists according to the principle of the, combined, electronic and pyrotechnic Automatic Activation Devices. Its primary task is to activate a pyrotechnic loop cutter at an altitude and speed by which you reasonable may expect that if, via the loop cutter or manually via the reserve ripcord, the parachutists reserve parachute is not activated this could result in serious injury or even death.

The device is via several sensors able to determine the parachutist's position in:

- Freefall (back, belly, spin etc.)
- Ground
- Aero plane (ascending, descending)

If the data received via the sensors of above are in line with the parameters, as described in 3.1, activation will take place.

3.3. Technical data

The Argus SIS and Argus TPM (military) have three main components:

1. Electronic unit (also known as the processing unit)

The electronic unit (fig. 3.1) is installed inside the parachute rig and holds all sensing devices, SMD(s) and the battery compartment. The power supply comes from two, standard of the shelf, CR123 batteries.

2. Control unit (also known as the remote control)

The control unit (fig. 3.3) consists mainly out of a (alphanumeric) display with backlight and the control switch. Via the control unit can the Argus be switched on and off and via the menu, other configurations are set such as mode change, altitude correction and conversions (meters to feet).

3. Cutter (single or double)

Designed especially for the Argus, the cutter (fig. 3.4) severs the reserve loop cutting it with a blade. The cutter has been tested by Nobel Enterprises and Aviacom on 30 extra activations, using -non stretched- common loops, loop material and steel wire (fig. 3.4.3 1 & 2).



Further technical data:

- Electronic unit: Length: 86mm/ 3.4 inch, Height: 20mm/ 0.8 inch, Width: 39 mm/ 1.5 inch.
- Control unit: Length: 65 mm/ 2.5 inch, Height: 8 mm/ 0.3 inch, Width: 20 mm/ 0.8 inch.
- Cutter: Length: 44 mm/ 1.7 inch, Diameter: 9 mm/ 0.35 inch

- Cabling: Electronic unit; Length: 500 mm/ 19.7 inch, Diameter: 4 mm/ 0.16 inch
 Control unit; Length: 600 mm/ 23.6 inch, Diameter: 4 mm/ 0.16 inch
 Shielding braid; 91%
 Bent radius; 8mm/ 0.31inch (min.), Bent diameter 16mm/ 0.63 inch (fig 3.4.1)

- Connectors: Industry standard M8/ ¼; one 3PIN plus one 4PIN

- Volume: Electronic unit; 67.08cc/ 4.1 in³
 Control unit; 10.4cc/ 0.63 in³
 Cutter; 2.8cc/ 4.1 in³
 Total volume; XXCC (including cabling and connectors)

- Weight: 170 grams (total unit, including batteries)

- Water resistance: IP 67 (30 minutes/ -3ft) by a replaceable Gore-Tex filter*
 Humidity (condensing 99.9%)

- Temperature: Storage; +80°centigrade/ 176°F to -40°centigrade/ -40°F
 Working; +65°centigrade/ 149°F to -30°centigrade/ -22°F

- Altitude: adjustment limitation; 500 m/ 1640ft (from take-off level)
 Operating range; -500m/ -1640ft to 9000m/ 29500ft (Argus SIS)
 -500m/ -1640ft to 15.000m/ 49200ft (Argus TPM)

- Power: Supply; two CR123 batteries* (standard lithium) or
 " BA-5123/U batteries* (military)
 Replacement; each year

- Functioning: Period; 14 hours after each switch on
 Check up; each 4 years, lifetime: 12 years>



* please see: Components CR-123 & BA-5123/U batteries

***CR-123 & BA-5123/U batteries**

The use of CR-123 or BA-5123/U lithium batteries allows cross-application between the Argus SIS/TPM and other electronic gear, which guarantees a reliable –of the shelf- power source. The Argus is the only AAD to use 123 lithium batteries.

These lithium batteries extends battery life and allows for operation in extreme hot or extreme cold (arctic) environments. Additionally has the 123 battery a 10 year shelf life with no degradation. Alkaline batteries perform poorly at colder temperatures. Alkaline batteries must be above +4.5°centigrade/ 40°F for best results. Lithium batteries perform well across a much wider temperature range, including temperatures far below freezing.*

The CR-123 batteries provides the Argus with a maximum of battery life. The discharge is such that the unit receives full power for almost the entire life of the battery. This means that a lithium powered device can be used under the same conditions until the batteries are almost dead, an important factor as there must always be enough power left not just for readings but also for a cutter activation. We do however, strongly recommend to replace the battery well before the end of its life.

The 123 lithium batteries are the best known for its use in digital cameras. However, over the past years the CR-123/ BA-5123/U battery has proven to be a very reliable power source for electronic gear and tools used by military, coast guard, law enforcement and first responders such as: Directional Receiver and Homing Systems, Holographic Weapon Sights, Man-portable Laser Rangefinder & Digital compass assemblies, Night vision goggles, HTR-8 Tactical Receivers, Safety beacons for SAR helicopters, Radios, Helmet lights etc.

Most of this equipment is manufactured according to military specification/ standard 810 (MIL-SPEC/MIL-STD 810).

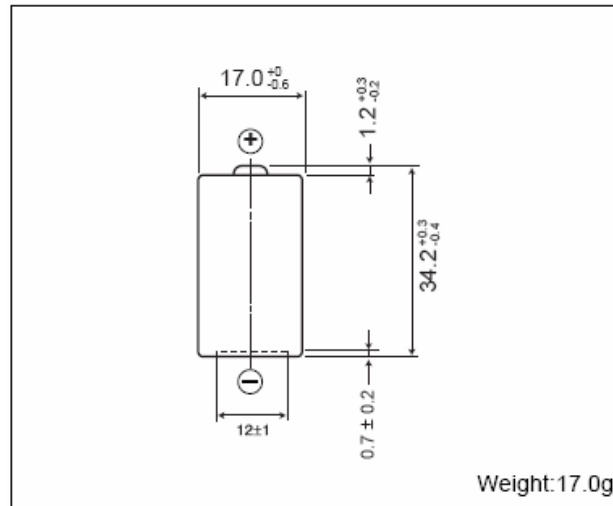


Aircrews rely during combat and SAR missions on Lithium -CR 123 or AA- battery powered night vision goggles.

**Operational temperatures will affect battery life.*

CR123A

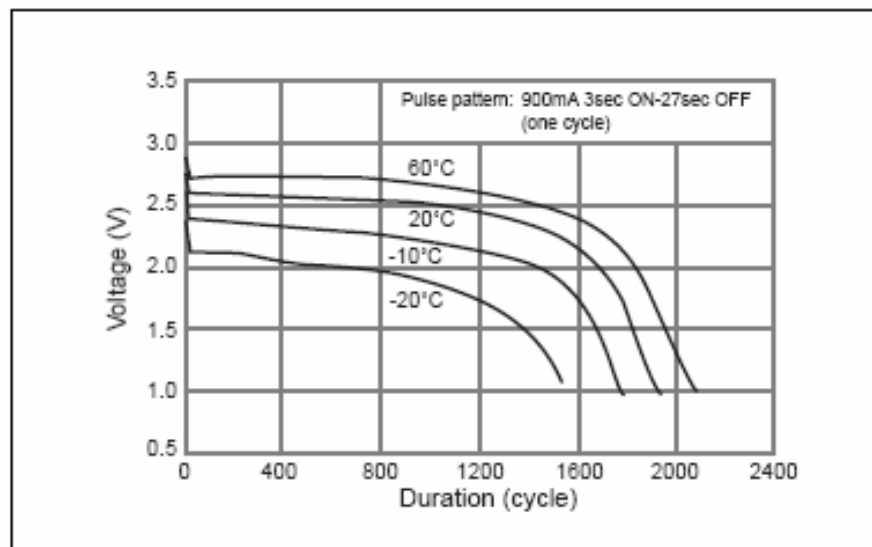
■ Dimensions(mm)



Further technical data:

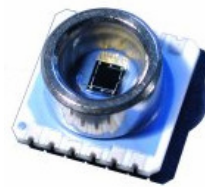
Nominal voltage:	3(V)
Nominal capacity:	1,550 (mAh)
Continues standard load:	20 (mA)
Operating temperature	-40°C/ °F to +70°C/ +°F (unprotected)
Standard:	ISO Standard 2281

■ Temperature Characteristics



Intersema MS5534 Air Pressure Sensor

In 1998 Intersema introduced the world's first digital Pressure Sensor Module for mobile applications. In 2000, Intersema developed a small size low pressure sensor with the highest output signal used in pressure sensor modules so-far. At the end of 2002 a absolute pressure sensor for high volume automotive applications became available. This model (MS5534B) suited in 2004 –by performance and size- the requirements for the Argus AAD. Intersema’s impressive track record made it further the obvious choice for the air pressure sensor we were going to use.



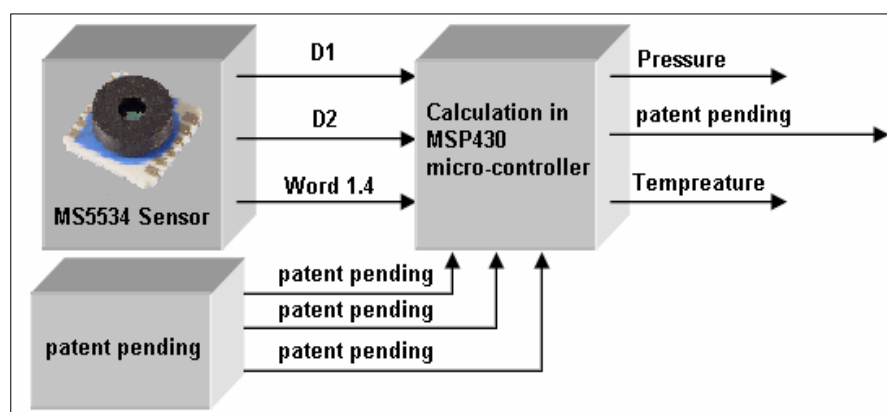
MS5534B

MS5534B

The MS5534B consists of a piezoresistive* sensor and a sensor interface IC. The main function of the MS5534B is to convert the uncompensated analogue output voltage from the piezoresistive pressure sensor to a 16-Bit** digital (pressure) value, as well as providing a 16-Bit digital value for the temperature.

- measured pressure (16-Bit) "D1"
- measured temperature (16-Bit) "D2"

The output voltage of the pressure sensor depends strongly on temperature and process tolerances. To compensate for these effects a compensation procedure -the module contains 6 readable coefficients for a highly accurate calibration- is performed by software using an external microcontroller. A 3-wire interface is used for all communications with the microcontroller. Every sensor is individually factory calibrated, the calibration data is stored inside the 64-Bit PROM memory.

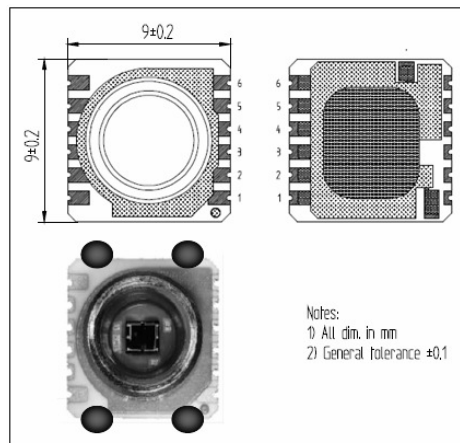


*The piezoresistive effect describes the changing [electrical resistance](#) of a material due to applied [mechanical stress](#).

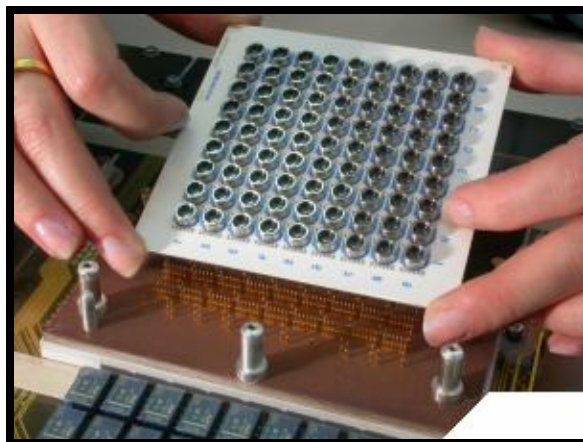
**A 16-bit integer can store 2^{16} (or 65536) unique values.

Further technical data:

Pressure range: 10 - 1100 mbar absolute pressure range
Size: 9 x 9 mm
Interface: 3-wire serial
Voltage: 2.2 V to 3.6 V
Operating temperature: -40°C/ -40°F to +125°C/ +257°F (unprotected)
Standard: ISO Standard 2281

**Test & Calibration**

- Automated sensor testing with temperature and pressure from -40°C/ -40°F to +125°C/ -257°F
- Passive and active laser trimming
- Electrical (on-chip) trimming
- High throughput pressure/temperature chamber
- Sensor characterization before mounting
- Pressure calibrators

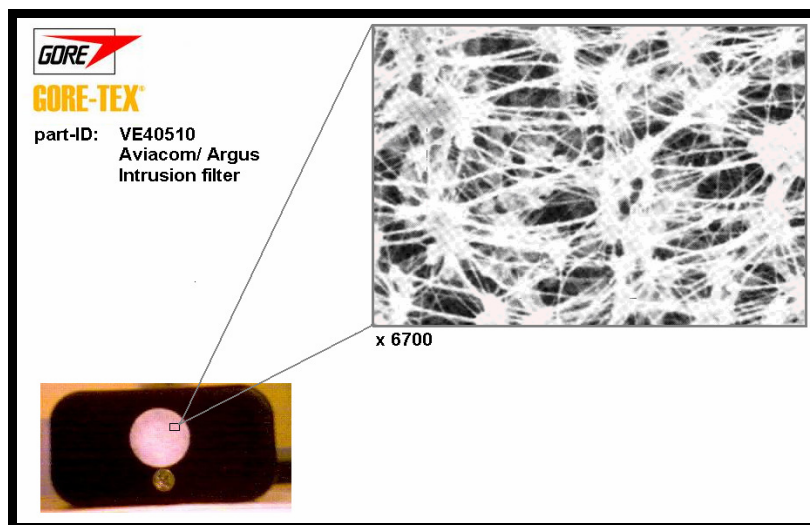


Adhesive Gore-Tex® water filter

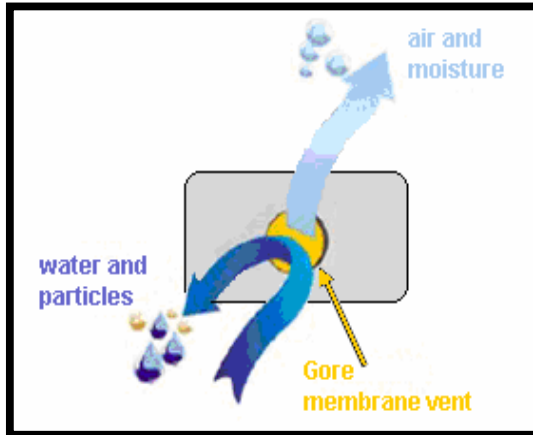
Polytetrafluoroethylene, or PTFE is in 1969 patented under the trademark Gore-Tex. Gore-Tex expanded PTFE is chemically inert. It has a low friction coefficient, which means it is smooth to the touch. It functions over a wide temperature range and has good aging qualities. It is porous, air permeable, strong, hydrophobic and weather durable.

The microporous nature of Gore-Tex has led to extensive filtration applications. The –so-called- bi-component membrane makes the Argus water filter extremely water resistant. It has about 9 billion [pores](#) per square inch, each of which is approximately 20,000 times smaller than a water droplet but 700 times bigger than a molecule of moisture vapor. This makes that water in its liquid form cannot penetrate the Argus but moisture vapor can easily escape the unit.

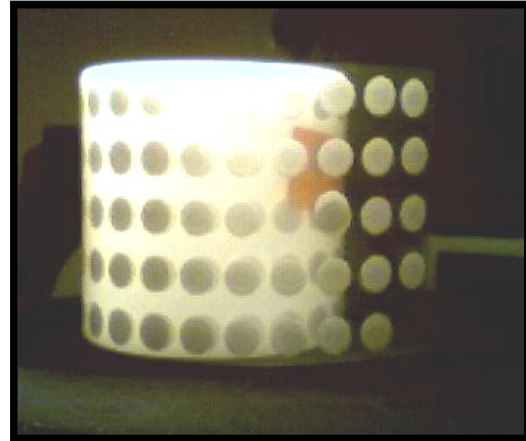
The Argus Micro-Filtration Membrane combines a high flow rate with high filtration efficiency, enabling high rates of airflow while remaining impermeable to water, aerosols, and particles.



Enlargement (x6700) of a Gore-Tex® intrusion filter as used in the Argus SIS/TPM models



Functioning of the Gore-Tex water
- intrusion filter on the Argus models



Role of Argus/ Gore-Tex water intrusion filters

Argus filter technical data:

- **Membrane Characteristic** (AATCC 118-1997ASTM)
Hydrophobic, Water entry pressure of the membrane ≥ 0.4 bar/60 sec
- **Salt Spray Test** (DIN 50-0-21)
No penetration of salt crystals through the membrane into the housing.
- **Ingress Protection of Vent System**
IP65 - Water jets
IPX7 -1 meter/ 3ft water submersion up to 30 minutes
- **Temperature Resistance**
Service temperature range of -40°centigrade/ -40°F to 70°centigrade/ 158°F. (unprotected)
- **Particle entry protection** (@ 3.2 m/min)
> 99.997% efficient against 0.1 μ m* particles
- **Typical Airflow @ dp=70mbar in ml/min**
> 840

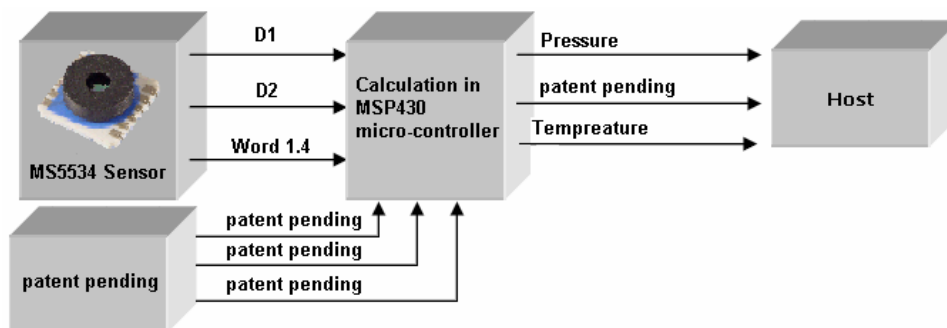
*micrometer (μ m) (10⁻⁶ meter = 0000 001 meter)

Texas Instruments MSP430 (mixed Signal Microcontroller)

The Argus is equipped with Texas Instruments microcontrollers. The microcontroller is ultra-low on power and has two built-in 16-bit timers, a fast 12-bit A/D converter, two universal serial synchronous/asynchronous communication interfaces (USART), and 48 I/O pins. The digitally controlled oscillator (DCO) allows wake-up from low-power modes to active mode in less than 6 micro second (6µs).

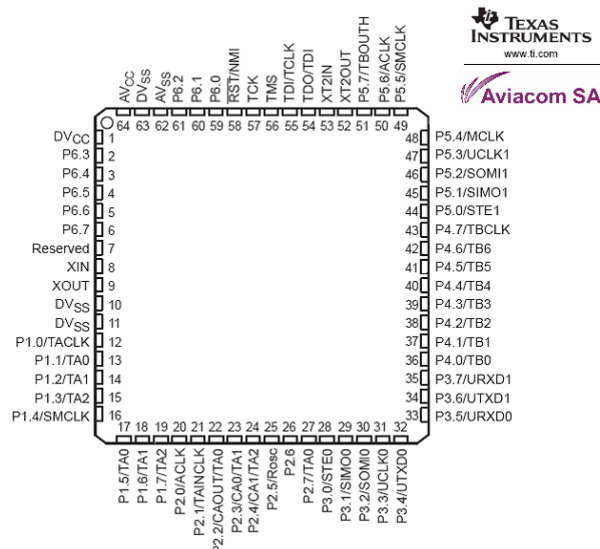
This microcontroller is designed for sensor systems that capture analog signals, convert them to digital values, and process and transmit this data to a host system.

This microcontroller is beyond any doubt the best microcontroller for an AAD.



Argus Microcontroller technical data:

- Low Supply-Voltage Range, 1.8 V . . . 3.6 V
- Ultralow-Power Consumption
- Five Power-Saving Modes
- Wake-Up From Standby Mode in less than 6µs
- Autoscan Feature (continuously analyses of incoming signals and reject false alarms)
- Working temperature -40°C/ -40°F to 85°C/ 185°F (unprotected)



BRIM MINIFLYX ULTRA-FLEXIBLE SHIELDED INSTRUMENTATION CABLE

BRIM Electronics, Inc. is a US manufacturer of electronic and electrical wires and cables. The company is known for its highly specialised cabling used by the military, medical and in aeronautics and space industries. The type cabling as used for the Argus can –amongst other applications- be found back in medical instruments, missiles and servo-systems. Brim flexible cabling qualifies for the MIL-W-3861, MIL-C-3432, MIL-W-22759/2 and MIL-16878-D standard.

The Argus cabling has highly flexible stranded conductors with a special soft, flexible insulation, a highly flexible tinned copper shield and a soft flexible PVC jacket overall.



Argus cabling technical data:

Shielding braid:	91%
Bent radius:	8mm/ 0.31inch (min.)
Bent diameter:	16mm/ 0.63 inch
Voltage:	300 V
Operating temperature	-40°C/ -40°F to +90°C/ +194°F (unprotected)

Hirschmann ELST3308/ 4408 Connectors

The cable is as good as the connector is (and vice versa). Our prime requirements for the connector were:

- **Lockable:** To increase reliability, we were looking for an alternative for the commonly in use audio jacks for cutters and remote controls. Audio jacks cannot be locked and can therefore be disconnected easily from its socket with little or no force.
- **Multiple contacts:** More than one contact to guarantee an undisturbed data transmission –or order to activate the cutter- is with today’s disciplines and material handling not a luxury but a pure necessity.
- **Easy to attach/ detach:** To decrease the downtime of the unit, cutters and remote controls should be easily –field- replaceable without opening the unit and thus avoiding unnecessary damage to the unit.
- **Error proof:** The cutter should only be able to be connected to the cutter socket, the remote control should only be able to be connected to the remote control’s socket. If a mistake would be made –Murphy- it should have no serious consequences such as a short cut -or even worse- misfire.
- **Water resistant:** The most water intrusion prone part of an AAD are the connectors. This had to be avoided.

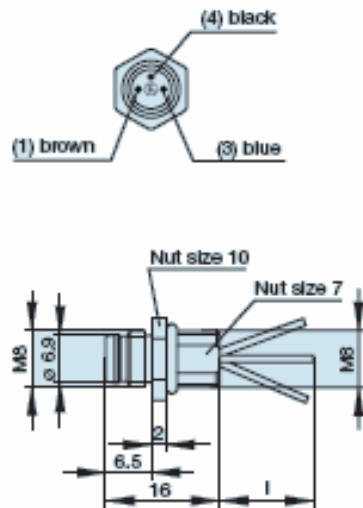


ELST 3308

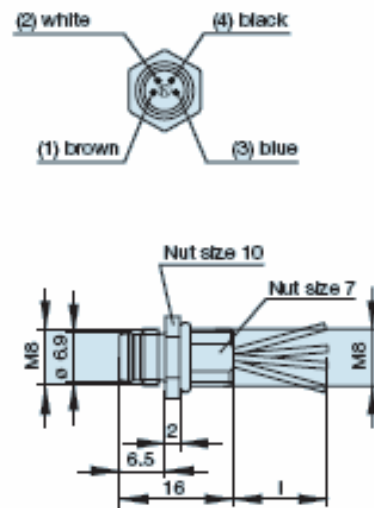


ELST 4408

Aviacom’s search brought us to Hirschmann GmbH, a Germany based international leader in communication and industrial electronics. They selected the ELST 3308, 4408 connectors. The connectors are equipped with respectively 3 or 4 contacts for cutter and remote, water resistant and can be locked easily.



ELST 3308



ELST 4408

Further technical data:

Type:	ELST 3308 RV FM 8 05
"	ELST 4408 RV FM 8 05
Type of contact unit:	male
Type of contact cutter & remote:	female
Number of contacts cutter:	3
Number of contacts remote control:	4
Contact points:	gold plated
Standard:	IEC 61076-2-101/ IEC 60947-5-2

Argus Metron Actuator DR 5010 Reefing Line Cutter

The Argus cutter (DR 5010) is developed for Aviacom SA/NV with as basis the DR 5000 series of Nobel Enterprises Ltd. The cutter is produced at the Nobel site in Ardeer Scotland. At this location also the majority of the live cutter testing takes place. Nobel Enterprises in Scotland is the worlds oldest explosives factory and has a tremendous experience in the development and production of pyrotechnic cutters for all sorts of purposes.

Argus cutter technical data:

Length:	44 mm/ 1.7 inch, Diameter: 9 mm/ 0.35 inch
Cutter:	cylindrical
Explosive weights:	100 mg (not exceeding)
Access diameter:	5 mm (max)
Classification:	Excluded from UN Class 1 (designated as not presenting a significant hazard from explosion)
Device protection:	Self contained, not emitting any hot gas or projectile(s) on functioning.
Operating temperature:	-65°C/ 85°F to +100°C/ 212°F (unprotected)
Suitable loop material:	Spectra 550, 725, 1000, Type IIA*

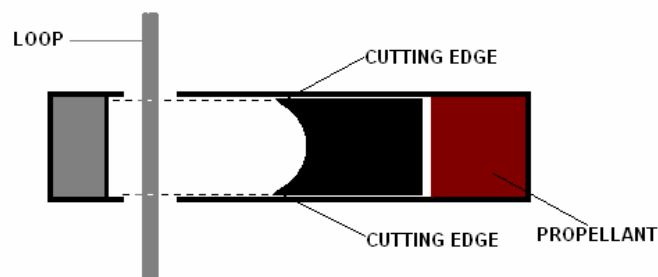
*more detailed, see Compatibility.

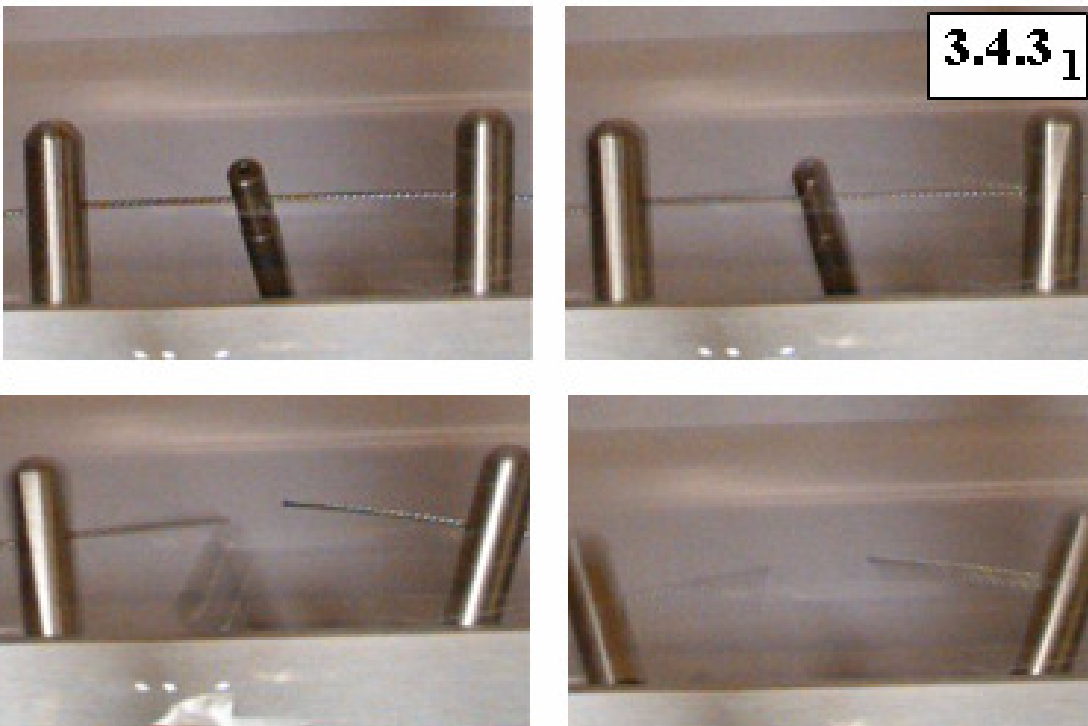
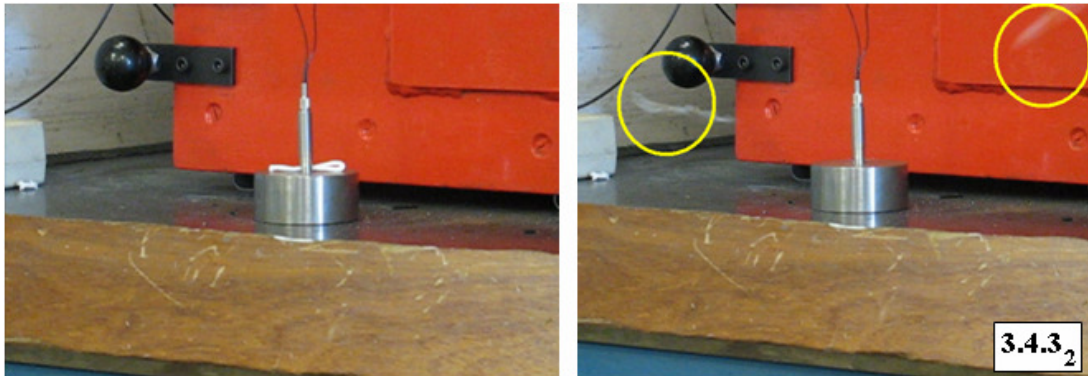


Nobel energetics

Energetics
Ardeer Site
Stevenston
Ayrshire
Scotland
KA20 3LN
www.nobel-energetics.com

DR5010 reefing line cutter/ Metron Actuator DR 5000





3.4. Limitations

Minimum altitude: The Argus needs a minimum of 500 m/ 1600 ft elevation from the switch on point (0) to arm itself. Therefore, the Argus is not suitable for:

- Low altitude jumps by which the plane has not reached a minimum altitude of 500 m/ 1600 ft.
- Base jumps.
- Extreme high altitude jumps of 8000m/26000 ft or higher. (exception the Argus TPM.)
- Elevation differences between take off and landing zone of more than 500m/ 1600 ft.

3.5. Preventive means of the device to minimize the affects of system or sub system failures.

To reduce the chance of an error, during a parachute jump, to an absolute minimum, the device performs the following self-tests:

At start up:

1. Battery* (power -should be sufficient for minimal 28 hours + cutter activation-**)
2. Cutter* (+ cabling, connector)
3. System* (Electronic unit: complete check electronics -pressure sensor, calibration ground pressure etc-, Control unit, cabling, connector)

If any failure during the start up sequence is detected, the Argus will show the defect and shut down (fig 3.6).

*see fig 3.5

** If the value of 1. is reached, the device will not start up. Well before this value is reached a battery low message appears each time the device is switched on (fig. 3.7).

During the parachuting window (14 hrs):

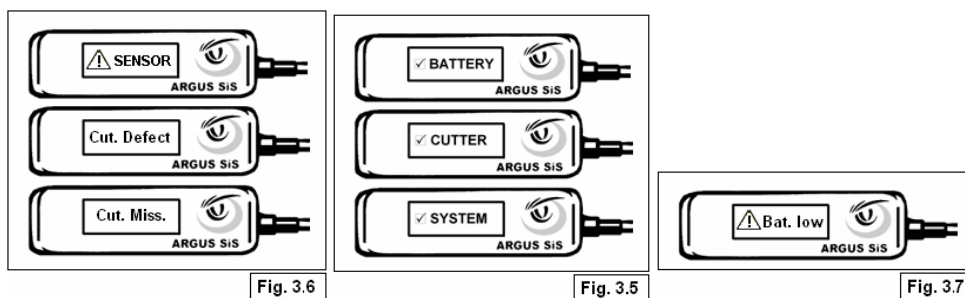
4. Ground pressure (re)calibration
5. Environment measurement (check for abnormalities in air pressure and stability)

If at this stage any failure or abnormality is detected, the Argus will shut down or go into stand-by. (For example an abnormal fast depressurization or freefall speeds over 500 km/h, 300m/h.)

Remote Control:

If for any reason the remote control gets defect during a parachute jump, the unit remains fully functional.

The Argus is a multi-mode device. To avoid that "by accident" the unit is set in another mode or change of any other setting (including altitude and imperial/metric setting), any change has to be confirmed twice via <validate> and <confirm>.



4. Testing

4.1. General overview of the testing program

- Data logging & gathering
- Computer Simulations
- Pressure chamber tests
- Dummy drops in all four modes.
- Live skydives NO GO (no activation) testing, with and without altitude correction
- Live skydives GO (activation) testing
- EMC and ESD testing
- Climate & environmental testing
- Compatibility testing

4.2. Data logging and gathering

Data has been logged by different skydivers worldwide, over a period of 12 months and in more than 750 skydives. Logging was done while performing Formation Skydiving, Freefly, Tandems, Accuracy and Swoops. To simulate unconsciousness and "student behavior" around 100 "unstable" skydives were made. All data was logged on custom made devices and ready available parachuting data loggers (Alti-2, Neptune).

Data gathering was not excluded to the parachute jump (after exit) itself. Also data during long waiting periods (while fitted), parachutist movement (by vehicle), (Turbine)-engine start (with open and closed doors), take off, steep landings and pressurized cabins was gathered. Special attention was given to the effect of turbulence in –and while opening- the door, floating and at exit –slipstream- at a variety of airplanes; ranging from the open door Cessna 182 up to tailgate and side door exits of the C-130.

Data was compared (and in some cases supplemented) with initial data and findings in literature (such as: Parachute Recovery Systems Design Manual/ by Theo W. Knacke), manuals from the aerospace industry (Cessna, Lockheed Martin and Pilatus) and interviews with pilots doing parachutist drops (military and civilian) on a variety of airplanes.



Argus custom build data-logger

4.3. Computer simulations

All data has been used in a computer simulation program after which the definite parameters for the four modes were set and the first version of the software could be written.

Parachute jumps, plane rides and other conditions were simulated under a variety of circumstances. Time after time the software was being fine tuned. To test the software under real pressure changing conditions and its interaction between remote control and cutter, a first prototype for use in a pressure chamber was build. (fig. 4.1)

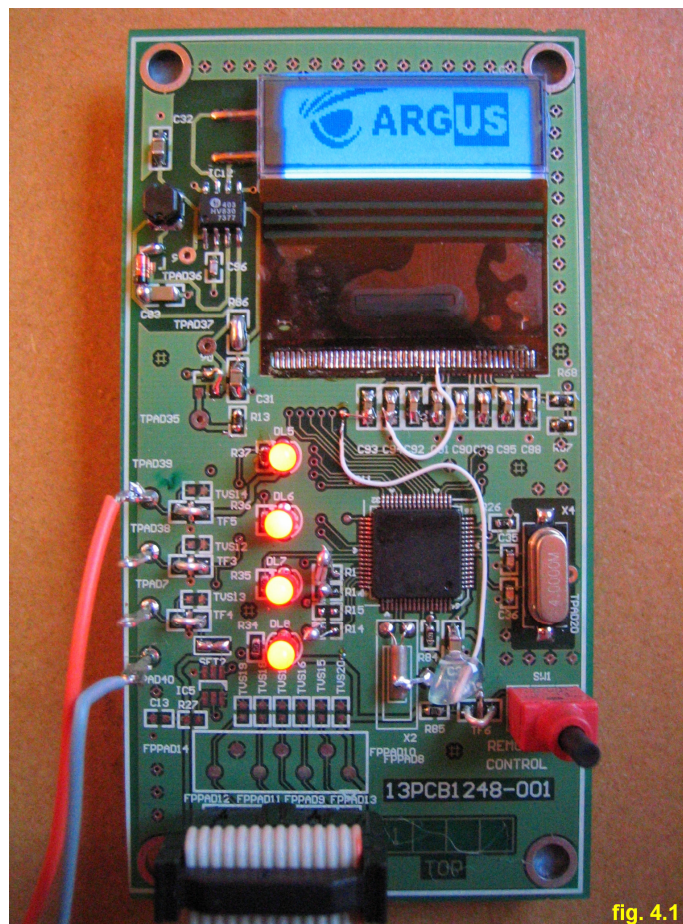


fig. 4.1

4.4 Pressure chamber tests

Pressure chamber test were performed at various locations and different chambers. However, most tests were carried out with:

- Willot (Tubular) test chamber, owned and operated by Aviacom SA. This chamber has 3 pre-settings of 20m/s (45mph), 10m/s (22mph) & 50m/s (112mph). Next to these, the Willot has a variable setting, allowing us to accurately simulate freefall, cut-away, and flights under high performance and student canopies. (4.2)
- French Army, Montauban, France, Captain Marc Groleau (4.3)

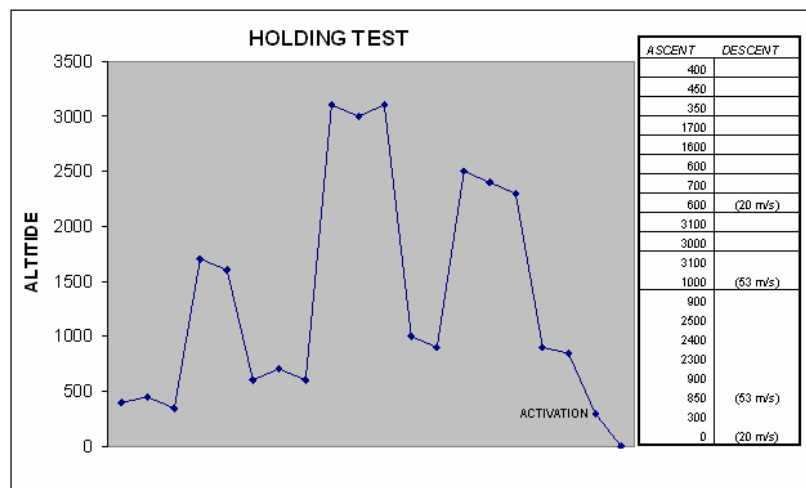
During the development and test period 2350 simulated jumps were performed. Jumps were made in all four modes, GO and NO GO (appendix 1.0) and in holding situations (4.4).



4.2



fig. 4.3



4.4

4.5 Dummy drops

Drop-test dummies were used for low- and average-altitude drop tests. Exit altitudes were:

420m/ 1350ft	600m/ 1950ft	1000m/ 3300ft	1500 m/ 4900ft
500m/ 1600ft	800m/ 2600ft	1200m/ 3950ft	

- Tests were performed in all four modes in sessions of 3 jumps each.
- The dummies were as well positioned belly up as belly down (using a stabilizer)
- All test jumps are documented; some can be seen on the website: www.argus-aad.com.

4.6 Live jumps (activation and no activation, loop by-passed)

1000 Live "NO GO" (no activation) jumps were made. Special vests made it possible to carry up to 18 units per jump. Forty units were distributed amongst skydivers around the world and made on these a total of 3500 jumps in a four month period.

50 Live "Go" (with cutter activation) jumps were made. To guarantee a speedy download and analysis of data, the majority of these tests were carried out in Spa Belgium. At Spa, the units were tested in all four modes with a positive altitude correction necessary to trigger activation:

Mode	"Normal" Activation altitude*	Altitude Correction*	"New" activation altitude*	Number of jumps	Number of activations
STANDARD	250	1000	1250	2	2
"	"	750	1000	4	4
"	"	500	750	6	6
NOVICE	300	900	1200	4	4
"	"	700	1000	4	4
"	"	400	700	5	5
TANDEM	660	1200	1860	5	5
"	"	1000	1660	5	5
SWOOP	250	1000	1250	2	2
"	"	700	950	5	5
"	"	450	700	8	8

The units were tested by freeflyers, swoopers, formation skydivers, cameramen and during tandem rides.

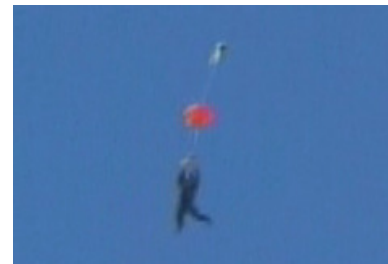
All units were sent back to Aviacom S.A. on a regular basis for data downloads and further testing.

Units were amongst other locations, tested at:

Deland (USA)	Perris Valley (USA)	Teuge (NL)	Spa (B)
Empuria Brava (SP)	Rotterdam (NL)	Eloy (USA)	Maubeuge (Fr)

4.6.1 Live skydives GO (with activation, loop through cutter)

25 live skydives, canopy deployed by the Argus, were performed at Eloy Arizona, Maubeuge France and UAE. The tests were carried out with a Vector III harness, Javelin and a spring loaded main canopy of which the loop went through the Argus cutter. During these jumps the Argus was set in Standard, Novice and Tandem mode. (www.argus-aad.com/testcorner)



Gray and Bernie make a test jump with an Argus in Novice mode (Eloy, February 2006)



Test jump with an Argus in Tandem mode (Eloy, February 2006)

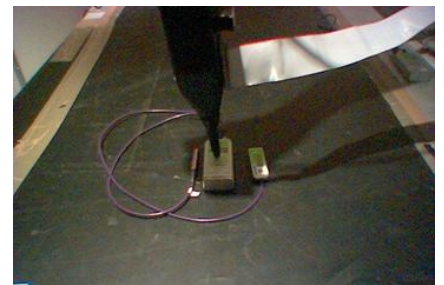
4.7 EMC and ESD testing

To minimize any external influences in performance, the Argus has been designed with superior shielding in mind.

During development as well as the end product the Argus was tested by De Nayer Laboratories in Brussels. Tests were performed concerning EMC (Electromagnetic Compatibility) and ESD (Electrostatic Discharge).

All test results are documented in the official test report E.T.-C-2045, issued on 13-01-2006. A summary of the test results can be found in fig. 4.5:

Basic Std	Variant	Port	Result	Note
EN 61000-4-3	Radiated Immunity and GSM immunity	Enclosure	Pass	10V/m
ETSI EN 300 386 V1.3.2(2003-05)		Enclosure	Pass	10V/m
EN 61000-4-2	Contact electrostatic discharge immunity	Enclosure	Pass	4kV
EN 61000-4-2	Air electrostatic discharge immunity	Enclosure	Pass	25kV
En 61000-4-2 VCP Plain	Contact electrostatic discharge	Enclosure	Pass	8kV
				Fig. 4.5



4.8 Climate and environmental testing

Water resistance:

The Argus is designed to remain functioning according to the **IP 67** norm being the complete unit being submerged for 30 minutes at a depth of 1m (3ft).

10 units were placed at a depth of 3m (9ft) for 2 hours (3 times the norm). To simulate a long period in a reserve container containing a water pocket, the Argus has been submerged at a depth of 15cm (6inch) but for a period of 12 hours (fig 4.6).

All units were without drying or filter replacement directly placed in the pressure chamber and go and no go jumps were simulated (under which one of 9000 meters). All units functioned within their parameters.

When connectors were disconnected and units opened, on both battery and connector sides, no traces of (water) intrusion were observed.

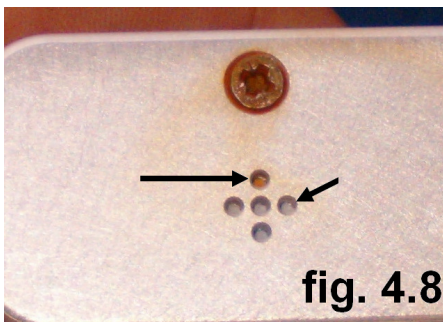


Humidity:

Three Argus units were taken to the island of Nias in the Indonesian archipelago. Humidity at Nias is 95% all year round by a temperature of 40°C (104° F.). The units remained, unprotected, on the island for 4 months (July-October 2005). After return to Belgium, November 2005, the units were put in the pressure chamber and functioned as expected. The units have externally some signs of exposure to humidity and salt, especially around the closing screws (fig. 4.7). These screws have meanwhile been replaced by a better quality stainless steel screw.

Salt:

Two Argus units underwent in the Netherlands a salt fog test with a high salt content of 5%. The duration of the test was 24 hours which was afterwards extended with another 24 hrs. During the second phase clear signs of corrosion around the closing screws appeared. After this test the unit functioned within its parameters although the filter was partially cloth up (fig. 4.8).



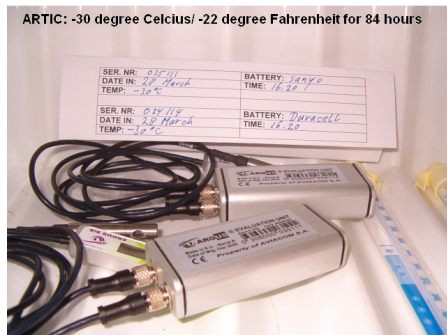
Temperature:

Four Argus units were exposed for 12 hours to temperatures of 80°C (176°F.) in a heat radiation room (heat created by spiral lamps). After a 2hour cool down, the units were placed in a freezer with a temperature of -30°C (-22°F.) and remained there for 84 hours (fig. 4.9).

Immediately after being removed from the freezer, the units were able to be switched on. The remote control showed the complete start up sequence (fig 4.10). The cables lost approximately 60% of its flexibility, which returned within 10 minutes after being removed from the freezer.

Within 3 minutes after being removed from the freezer, the units were placed in the pressure chamber and tested on two No Go and two Go jumps. The units functioned within their parameters.

To test any internal and external condensation influences was this test repeated after 1, 2, 4 and 6 hours.

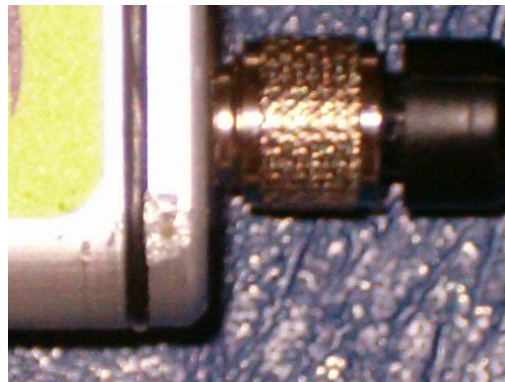
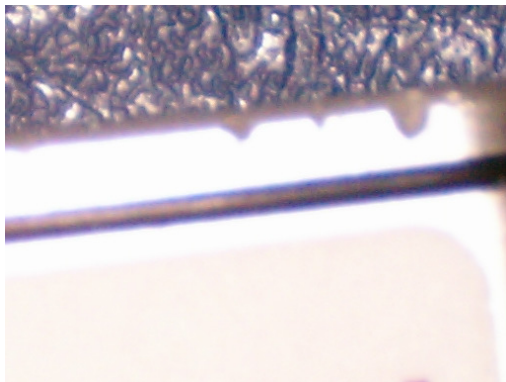


Shock:

Five complete Argus units have been dropped on a concrete surface from:

- 1.5 meter (5ft) six times
- 2 meter (6ft) for four times
- 4 meter (13ft) for four times

The aluminum body clearly had signs from the impact but functioned well when tested in the pressure chamber.



Vibration:

Six complete Argus units have been put on a vibration table:

- Vibration: 20 hertz for 90 minutes*
- Vibration: 30 hertz for 90 minutes
- Vibration: 40 hertz for 90 minutes
- Vibration: 50 hertz for 90 minutes

*1 cycle/second = 1 hertz



All units functioned without any problem while tested in the pressure chamber.

Aging:

All test as described before and if used in accordance with the user's manual, the lifespan of the Argus not limited by the use of its electronics or in the handling of its mechanical parts and components. The service life for the unit should largely exceed 12 years.

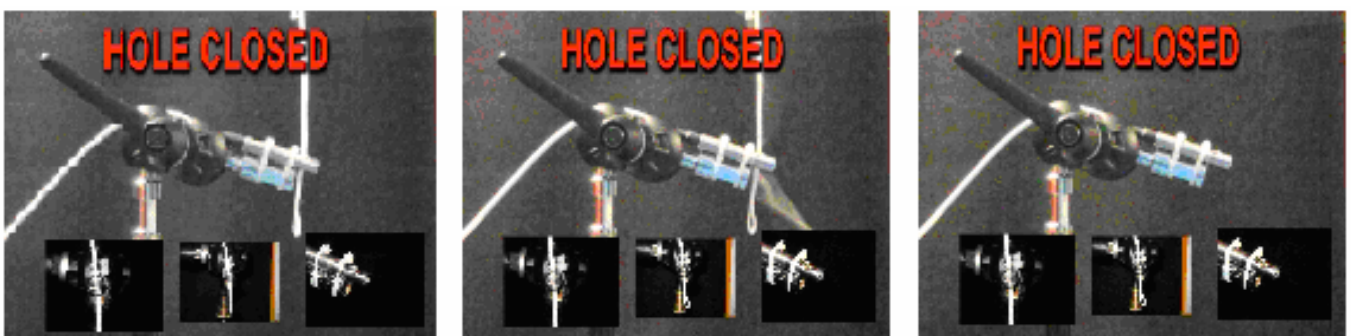
4.9 Compatibility & installation

Compatibility and installation testing is carried out for harness compatibility, cutter location and cutter performance. All major H/C manufacturers have been requested to submit a H/C for independent testing or accept an Argus SIS to run their own tests. The compatibility requirements from the different manufacturers ranged from: "Does it fit in the available installation set up" up to dummy drop tests done by the H/C manufacturer itself.

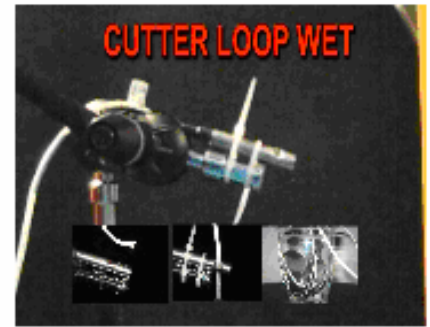
When a harness container was submitted to Aviacom, the tests were outsourced to the European Academy of Parachute Rigging in Germany. There the H/C underwent a compatibility test according to the current AAD installation guidelines from the manufacturer plus testing with alternative cutter locations and loop lengths. The outcome of these tests were communicated with both parties by which from both sides recommendations were given concerning the installation of the Argus in that particular H/C system.*



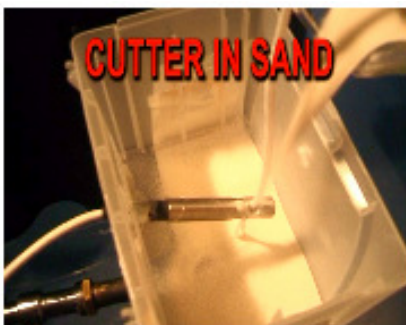
The European Academy of Parachute Rigging in Germany performed also the independent tests concerning the Argus cutter performance when using alternative locations different loop material, loop lengths, loop tension (pressure pilot chute) and extreme use such as cutter holes closed, wet loop material and with sand sprayed cutter and loop.



Cutter activation with the cutter hole fully closed.



Cutter activation with a soaked loop



Cutter activation with loop and cutter severely contaminated with sand

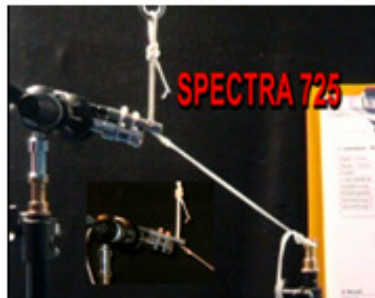
**Cutter activation with
Spectra 550**



The Argus cutter is during these tests severely placed outside of its design parameters. For normal use, the reserve container closing loop must be under a minimum –pilot chute- tension of 11 lbs/ 5 kg.

** See further Authorizations/ Approval & Compatibility*

Cutter activation with Spectra 725



Cutter activation with Spectra 1000



Cutter activation with zero tension



Cutter activation with Type IIA



5 Production and quality control

The experience we gained during the three stages (development, testing and production) is translated in a stringent quality control procedure for every Argus that leaves the factory. Quality control is taking place for:

- each part and component independently
- sub assemblies
- total product

5.1 Purchased parts/components

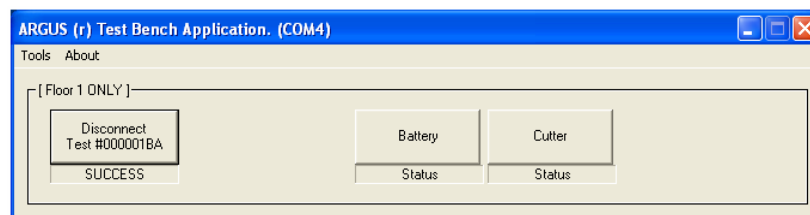
All parts and components manufactured for the ARGUS meet industry standards: Automotive or High-reliability specifications. The producers have been chosen based upon their long reputation concerning reliability, innovativeness, internal quality control, certification (ISO 9001-2000) and experience in avionics.

5.2 sub assemblies

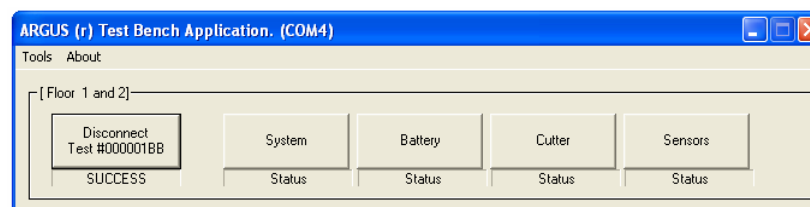
All sub assemblies are checked at the factory. Control of these assemblies is done via optical control and the first three phases out of a four phase test-bench. During these first three phases the unit is tested upon interaction between the sub assemblies and:

- Power (battery) and cutter (Phase I)
- System(control and electronic unit), battery, cutter and sensors (Phase II)
- Overall status of Phase I and Phase II (Phase III)

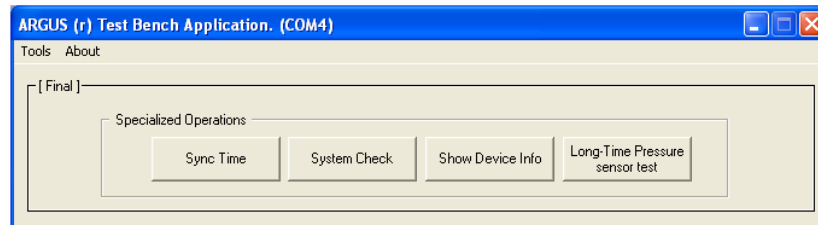
Phase I



Phase II



Phase III



5.3 Total product*

The final test program -that lasts one day to be completed- for units that come from the production line consists out of the following:

- Vibration testing
- Thermal chamber test
- Test bench (phase 4)
- Pressure chamber simulation tests
- Test bench (long time pressure sensor test)

**For the Argus TPM (military) a more extensive test procedure is in force including independent -in army- high altitude and arctic testing).*

Vibration testing

In batches of 25 the units are placed on a multiple speed vibration table. The vibration cycles used are equal to those of the development program but reduced in time:

- 20 hertz for 30 minutes
- 30 hertz for 30 minutes
- 40 hertz for 30 minutes
- 50 hertz for 30 minutes

Thermal chamber test

After the vibration tests the units are per batch of 50 placed in the thermal chamber for "burn-in" and arctic testing. The batch is temperature shock tested using two thermal chambers set for:

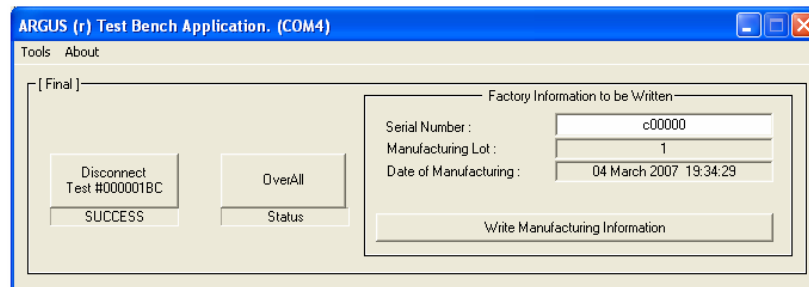
- 6 hrs at +70°C (+158°F)*
- 6 hrs at -30°C (-22°F)

** Transfer time between chambers maximum 5 minutes.*

Test bench phase 4

Phase 4 (final) of the test bench is a complete in-depth systems test of the units being completely assembled. Tested are all measuring systems, self check, activation signal and a so-called long time (loop period) test of the pressure sensor.

Phase IV



Pressure chamber simulation tests

Argus units undergo 2 pressure chamber simulation test jumps per mode (STANDARD, NOVICE, TANDEM or SWOOP) of which one is a No Go (parachutist opens parachute) and one is a GO (parachutist does not open). Furthermore are 3 cut-away simulations performed:

- One cut away simulation on STANDARD (cut-away at 350 meter/ 1150 ft)
- One Cut away simulation on TANDEM (cut-away at 600 meter/ 1970 ft)
- One Cut away simulation on SWOOP (after 5 seconds of open canopy ride -unit should not activate-)

MODE	JUMP	JUMP	
STANDARD	NO GO	GO	2
NOVICE	NO GO	GO	2
TANDEM	NO GO	GO	2
SWOOP	NO GO	GO	2
		TOTAL	8

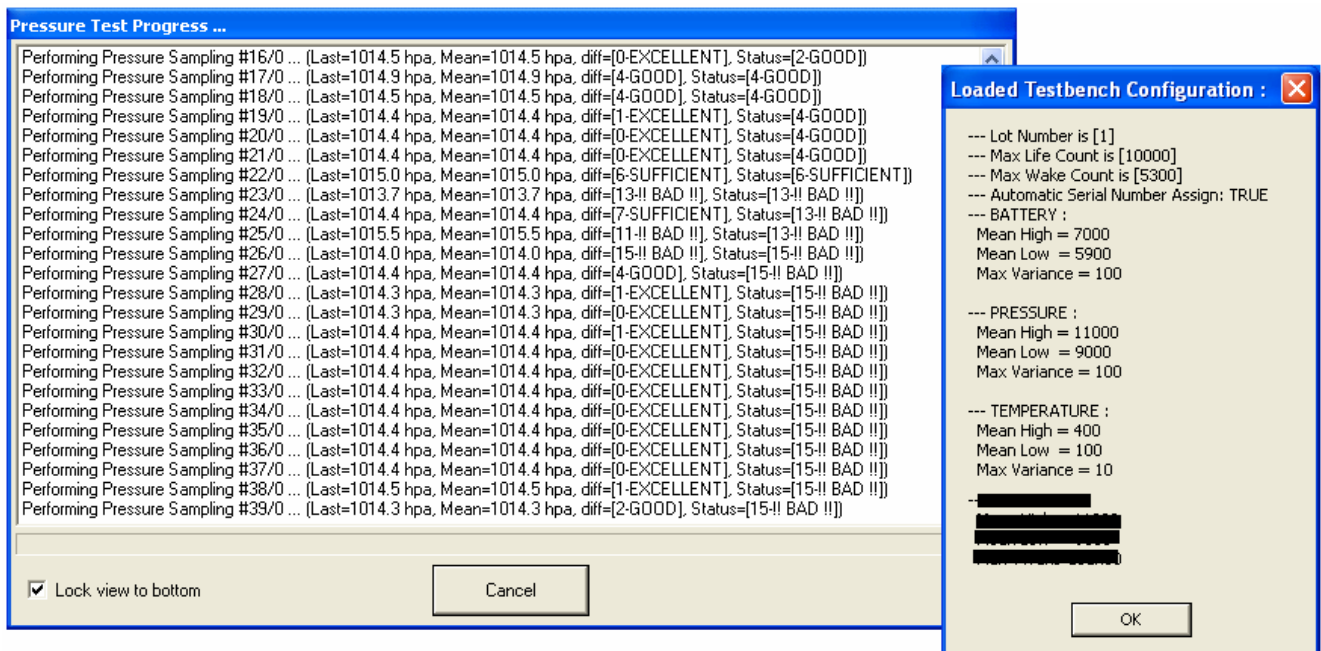
MODE	CUT-AWAY	
STANDARD	350 m/ 1150 ft	1
TANDEM	600 m/ 1970 ft	1
SWOOP	5 seconds open canopy	1*
	TOTAL	3

* UNIT SHOULD NOT ACTIVATE



Test bench long time pressure sensor test

Over an period of time the readings of the pressure sensor is checked and logged. During this test certain procedures are carried out which creates a rapid change in air pressure due to which we can check the pressure sensor's reaction, recovery and recovery time.



5.4 Random control (Cutters and Argus units)

From as well the cutters as complete Argus units are randomly chosen for extra testing:

- **Cutters:** Of every batch of 250 are minimal 5 cutters activated at the facilities of Nobel Energetics (Ayrshire, Scotland). Another 5 are activated at Aviacom itself.
- **Argus units:** We aim that minimal 20% of all Argus units (weather permitting) are taken on an actual skydive. The units are set in all modes to check their performances and are regularly preset with an altitude correction of 1000m (3300ft) to provoke an activation. Some of these tests take place at extreme locations like the deserts of the United Arab Emirates or the Pole.



South Pole March 7, 2007. Temp: -45° F (-43 C)



UAE March 2007. Temp: 104° F ($+40^{\circ}$ C)

5.5 Labelling and serial number allocation

Final stage of the production process is labeling the Argus units with the –to that device – allocated serial number. The label shows the date of manufacturing, type (SIS, TPM) and serial number. As well date of manufacturing as serial number are embedded in the unit's software and can be found via MENU>INFO>ADMIN.



6 installation & Periodical Control (mandatory)

6.1 Installation

Riggers can install the Argus under their own authority. The instructions of the harness/container manufacturer must be followed at all times. An Argus installation guide is available.

The batteries must be replaced once a year or by battery low. Depending on the country's aviation rules and regulations, a skydiver or a rigger can perform this replacement.

6.2 Mandatory Periodical Control

The Argus must be checked every 4 years counting after the date of first (field) use. (When installed).

The maximum life span of the Argus is unlimited, as long as the unit passes the four yearly tests successfully. In order to avoid (and to keep the Argus up and running during the season), there is a 3 month window for the 4-year control. The Argus can still get the periodical control at any later date, but the time frame will remain on multiples of 4 years +/- 3 months.

- These checks are necessary as the Argus is a technically very advanced and compact piece of equipment, which is often submitted to diverse mechanical and environmental forces. These demanding influences may cause the need for parts replacements or even reprogramming, even if the equipment is seldom used. The Argus functions during each jump (not only if it comes to a release). A release is the end of a constant working process. In order to guarantee that the device functions correctly - even after a long period - as accurately as new equipment, it is necessary to perform a thorough periodic examination.

- The periodical check-up is mandatory. The way the Argus is handled and stored will affect the life cycle. Daily wear and tear also does affect electronic components. Chemical reactions can affect the electronic components over the years and mechanical and thermal forces may have a substantial influence on electronic components over time. The examination of these influences and corrections with the interaction of all construction units are an important component of the 4 year check-up.

Aviacom and its partners see the functional check-up not only as a confirmation of that the Argus functions within its parameters. We would like to be as certain as possible that it will continue to remain error free also in the next utilization period.

Periodical control is a precautionary measure in order to assure the most important characteristic: the reliability of the Argus.

6.3 Periodical control schedule:

During the periodical control the following checks are performed:

- Check of the electronics, the cutter and the program
- Visual inspection overall state of AAD and of sealing rings and connectors
- Replacement of batteries and filter, Functional testing Go/No Go with test probe.
- Downloading of all data in Argus, Application of holographic control seal
- Test certification
- Optional: Replacement of sealing rings, Cutter or the remote control, Reprogramming of firmware, Standard exchange

➤ **Visual inspection**

How does the unit look like (for example any wear or tear on the cables, is the cutter head clean –often a problem with swoopers- etc.)

➤ **Download of data**

- The data of the last 150 jumps are downloaded for a first analyse.
- Systems data is downloaded and mailed to Aviacom where it is compared with the data of the unit when at production.

➤ **Go-and No Go tests**

As the Argus had the first visual inspection, the unit is put in the trace mode (1-2 data-logs a second) which allows us a very accurate read out of the units performance at every moment of the simulated skydive.

The unit's cutter is removed and replaced by a probe and put in the pressure chamber for a Go/No Go functional test. The minimum number of tests required is:

- 2 pressure chamber simulation test jumps per chosen mode (STANDARD, NOVICE, TANDEM or SWOOP) of which one is a jump simulating an open canopy ride and the other is a no pull situation.
- One cut away simulation on STANDARD (cut-away at 350 meter/ 1150 ft)
- One Cut away simulation on SWOOP* after 5 seconds of open canopy ride

**unit should not activate*

➤ **Battery and filter replacement**

At each periodical check are as well the batteries as well as the Gore-tex water resistant filter replaced. Eventually the sealing rings or the battery cover has to be replaced. If a connector is damaged, the cutter or the remote control will be replaced.

6.4 Guarantee

Within our guarantee period from 2 years. Defective parts are replaced free of charge. After the guarantee period the owner will have to pay for the replacement of damaged parts. Spare parts and repairs are not included in the price of the periodical control.

If parts are replaced or an upgrade is performed the unit may be submitted, in order to assure the correct functioning of the unit, to additional testing.

6.5 Periodical control recognition

An Argus that successfully went through its functional check up can be recognised by a self adhesive holographic seal placed on the electronic (processing) unit. A label indicates the date of the control and a test certificate is written (first time after 4 years).

6.6 Service centres

The periodical control will be done by Aviacom itself or at one of the designated service centres. These centres will be carefully selected, based on their customer care and their high standards when it comes to maintenance of parachute equipment. These centres must have received their training from Aviacom before being certified.

In line with the increase of the number of units in the field , the number of service centres will also be expanded. So far servicing is done by Aviacom itself, the European Academy of Parachute Rigging in Germany and the Argus Service Center in the United States:

European Academy of Parachute Rigging
Luitpoldstraße 30
87700 Memmingen
Deutschland

+49 (0) 8331-92 87 87
+49 (0) 8331-98 56 83
+49 (0) 170-2847788
info@parastore.de

Argus USA Service Center (Chuting Star)
1195 Grady Road
Rockmart GA 30153-3919
USA

770-749-9184 (Loft)
678-231-2752 (Mobile)
770-749-9184 (Fax)
Rigger@Chutingstar.com

6.7

TEST SHEET PRESSURE CHAMBER SIMULATION TESTS

Date:	14/04/2006
Air pressure:	84.1hPa

GO

Mode	Alt. corr.	Pressurized with:	Exit altitude	Opening	Cut- away	Start count (m.)	End count (m.)	Distance (m.)	Total no. of sec.	m/sec.	Correct response	Average m/sec.
STANDARD	0	53 m/s	4500	*	*	400	200	200	4,83	41,41	Yes	
STANDARD	0	53 m/s	4000	*	*	400	200	200	4,16	48,08	Yes	
STANDARD	0	53 m/s	12500	*	*	400	200	200	4,59	43,57	Yes	
STANDARD	0	53 m/s	1500	1000	700	400	200	200	4,75	42,11	Yes	
STANDARD	0	53 m/s	3500	1200	500	400	200	200	4,53	44,15	Yes	
<u>43.86</u>												

Mode	Alt. corr.	Pressurized with:	Exit altitude	Opening	Cut- away	Start count (m.)	End count (m.)	Distance (m.)	Total no. of sec.	m/sec.	Correct response	Average m/sec.
STANDARD	*+250	53 m/s	3500	1000	800	600	400	200	3,93	50,89	Yes	
STANDARD	*-100	53 m/s	3000	*	*	300	100	200	4,95	40,40	Yes	
STANDARD	*-100	53 m/s	2500	*	*	300	100	200	4,77	41,93	Yes	
STANDARD	*-100	53 m/s	3500	*	*	300	100	200	5,34	37,45	Yes	
STANDARD	*+100	53 m/s	3000	*	*	500	300	200	4,01	49,88	Yes	
<u>44.11</u>												

NO-GO

STANDARD	0	20 m/s	4000	*	*	400	200	200	7,68	26,04	Yes	
STANDARD	0	20 m/s	4000	*	*	400	200	200	7,21	27,74	Yes	
STANDARD	0	20 m/s	4000	*	*	400	200	200	8,75	22,86	Yes	
STANDARD	0	20 m/s	4000	*	*	400	200	200	7,65	26,14	Yes	
STANDARD	0	20 m/s	4000	*	*	400	200	200	6,95	28,78	Yes	
<u>26.31</u>												

GO

Mode	Alt. corr.	Pressurized with:	Exit altitude	Opening	Cut- away	Start count (m.)	End count (m.)	Distance (m.)	Total no. of sec.	m/sec.	Correct response	Average m/sec.
STANDARD	*+500ft	53 m/s	3000	*	*	500	300	200	4,34	46,08	Yes	
STANDARD	*+500ft	53 m/s	3000	*	*	500	300	200	3,75	53,33	Yes	
STANDARD	*+500ft	53 m/s	4000	*	*	500	300	200	4,18	47,85	Yes	
STANDARD	0	53 m/s	3500	*	*	400	200	200	3,74	53,48	Yes	
STANDARD	0	53 m/s	4000	*	*	400	200	200	5,31	37,66	Yes	
<u>47.68</u>												

GO

Mode	Alt. corr.	Pressurized with:	Exit altitude	Opening	Cut- away	Start count	End count	Distance (m.)	Total no. of sec.	m/sec.	Correct response	Average m/sec.
NOVICE	*+1000ft	20 m/s	4000	*	*	700	500	200	8,01	24,97	Yes	
NOVICE	*+1000ft	20 m/s	4000	*	*	700	500	200	7,74	25,84	Yes	

NOVICE	*+1000ft	20 m/s	2500	*	*	700	500	200	7,97	25,09	Yes
NOVICE	0	20 m/s	4000	*	*	400	200	200	8,63	23,17	Yes
NOVICE	0	53 m/s	4000	1000	700	400	200	200	3,98	50,25	Yes
29,87											

NO-GO

NOVICE	0	10 m/s	5000	*	*	400	200	200	17,15	11,66	Yes
NOVICE	0	10 m/s	2500	*	*	400	200	200	17,38	11,51	Yes
NOVICE	0	10 m/s	3000	*	*	400	200	200	17,27	11,58	Yes
NOVICE	0	10 m/s	3000	*	*	400	200	200	18,03	11,09	Yes
NOVICE	0	10 m/s	3500	*	*	400	200	200	17,22	11,61	Yes
11,49											

GO

Mode	Alt.	Pressurized	Exit	Opening	Cut-	Start	End	Distance	Total	Correct	Average
	corr.	with:	altitude		away	count	count	(m.)	no.	response	m/sec.
						(m.)	(m.)		of		m/sec.
									sec.		
TANDEM	0	53 m/s	4000	*	*	700	500	200	4,33	46,19	Yes
TANDEM	0	53 m/s	4000	*	*	700	500	200	5,12	39,06	Yes
TANDEM	0	53 m/s	4000	*	*	700	500	200	4,14	48,31	Yes
TANDEM	0	53 m/s	4000	*	*	700	500	200	3,98	50,25	Yes
TANDEM	0	53 m/s	4000	*	*	700	500	200	4,23	47,28	Yes
46,22											

NO-GO

TANDEM	0	53 m/s	4000	*	*	700	500	200	8,33	24,01	Yes
TANDEM	0	53 m/s	4000	*	*	700	500	200	9,01	22,20	Yes
TANDEM	0	53 m/s	4000	*	*	700	500	200	8,45	23,67	Yes
TANDEM	0	53 m/s	4000	*	*	700	500	200	8,58	23,31	Yes
TANDEM	0	53 m/s	4000	*	*	700	500	200	9,02	22,17	Yes
23,07											

GO

Mode	Alt.	Pressurized	Exit	Opening	Cut-	Start	End	Distance	Total	Correct	Average
	corr.	with:	altitude		away	count	count	(m.)	no.	response	m/sec.
						(m.)	(m.)		of		m/sec.
									sec.		
SWOOP	0	53 m/s	4000	*	*	400	200	200	4,25	47,06	Yes
SWOOP	0	53 m/s	4000	*	*	400	200	200	4,36	45,87	Yes
SWOOP	0	53 m/s	4000	*	*	400	200	200	4,58	43,67	Yes
SWOOP	0	53 m/s	4000	*	*	400	200	200	4,67	42,83	Yes
SWOOP	0	53 m/s	4000	*	*	400	200	200	4,41	45,35	Yes
44,96											

NO-GO

Mode	Alt.	Pressurized	Exit	Opening	Cut-	Start	End	Distance	Total	Correct	Average
	corr.	with:	altitude		away	count	count	(m.)	no.	response	m/sec.
						(m.)	(m.)		of		m/sec.
									sec.		
SWOOP	0	53 m/s	4000	1000	700	400	200	200	4,12	48,54	Stand-by
SWOOP	0	53 m/s	4000	1000	700	400	200	200	3,98	50,25	Stand-by
SWOOP	0	53 m/s	4000	1000	700	400	200	200	4,56	43,86	Stand-by
SWOOP	0	53 m/s	4000	1000	700	400	200	200	4,54	44,05	Stand-by
SWOOP	0	53 m/s	4000	1000	700	400	200	200	4,01	49,88	Stand-by
47,32											

6.8

Authorizations/ Approval & Compatibility

Countries with (known) restrictions for AADs:

Country	Permission	Restrictions/ conditions
Germany	Granted	None
United Kingdom	Granted	No objection Harness/ container manufacturer
France	Granted	Written approval harness/ container manufacturer.
Netherlands	Granted	No objection Harness/ container manufacturer, evaluation period before use in student and tandem gear.
Australia	Granted	With restriction on use in student gear during evaluation period.
Norway	Granted	
Sweden	Granted	
Finland	Pending	

Written approval

H/C manufacturer:	Approved
Rigging innovations Inc.	YES
Aerodyne	YES
Sunpath Products Inc.	YES
Sunrise Manufacturing International Inc. (Wings)	YES
United Parachute Technologies (formerly RWS)	YES
Jumpshack	YES
Velocity Sports Equipment	YES
Mirage Systems Inc.	YES
Flying High	Pending
Firebird International GmbH + Co. KG (fmr Performance Variable)	YES
Atmosphere Gear	Pending
Strong Enterprises	Pending
Advance (France)	YES

6.9

References

Manufacturer:	
Aviacom SA/NV	www.argus-aad.com
Components:	
Brim Cabling	www.brimelectronics.com
Gore-Tex	www.gore-tex.com
Hirschmann	hus.hirschmann.com
Intersema	www.intersema.ch
Nobel Enterprises	www.nobel-enterprises.com
Texas Instruments (TI)	www.ti.com
Testing:	
Chuting Star Rigging Loft	www.chutingstar.com
De Nayer Laboratories (Alcatel-Bell)	www.labodenayer.be
European Academy of Parachute Rigging	www.guido-reusch.de
Argus test/evaluator team	www.swoopduvels.be

7.0



April 12, 2006

Argus
Karel Goorts
Leenveldstraat 42
3090 Overijse, Belgium

This letter is to certify that the Argus AAD is compatible with the Relative Workshop Vector sport and tandem series containers.

Should you have any questions regarding the above, please contact me.

Best regards,



Mike Forsythe
Engineering Manager



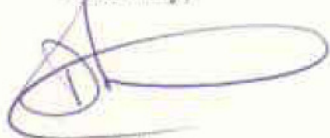
Thursday, April 13, 2006

Argus
Karel Goorts
Leenveldstraat 42
3090 Overijse
Belgium

This letter is to certify that the Argus AAD is compatible with the Sun Path Products Inc, Javelin Odyssey, Student Odyssey, Javelin, and Javelin Student, range of sport harness & container systems.

Should you have any questions regarding the above, please contact me.

Yours truly,

A handwritten signature in blue ink, appearing to read "Derek Thomas". The signature is stylized with a large loop and a horizontal stroke.

Derek Thomas
President Sun Path Products Inc

Sunrise Manufacturing International, Inc.

6520 Fort King Road • Zephyrhills, Florida 33542 • Phone 813-788-1910 • Fax 813-788-2796
www.skydivewings.com



April 24, 2006

Aviacom SA
Rue du Chateau 48
B-1420 Braine l'Alleud
Belguim

Mr. Karel Goorts:

Sunrise Manufacturing International, Inc. authorizes the use of the Argus AAD in the Wings Harness Container System. The installation/use must be followed by the guidelines in the Wings Harness Container System Manual.

Best regards,

A handwritten signature in blue ink, appearing to read "H. Pohjolainen".

Henri Pohjolainen
President



Jump Shack

1665 Lexington Ave. #106 DeLand, FL 32724 USA
(386) 734-5867 FAX (386) 734-8464 www.jumpshack.com

August 21, 2006

Argus
Karel Goorts
Aviacom SA/NV
Rue du château, 48
B-1420 Belgium

Dear Karel,

Jump Shack has issued a blanket approval for the installation of all AAD's in Racer Containers provided they do not interfere with the normal function of the system. The Argus appears to meet the criteria, and is therefore approved. Jump Shack assumes no responsibility for the function or installation of any such device. This approval is based on information provided to us by the AAD manufacturer.

Best Regards,

A handwritten signature in cursive script, appearing to read "Nancy LaRiviere".

Nancy LaRiviere
President



Attention : Aviacom SA/NV
Rue du chateau 48
B-1420 Belgium

Subject : Argus
Parachute Automatic Activation Device

Date : 29th August 2006

The Argus Automatic Activation Device (Mode : Standard, Student and Swoop) Part Number ARG001SIS, Manufactured by Aviacom SA/NV is approved for use in the Aerodyne, ICON Harness Container part Number P125 and P120.

The approval is based on :

1. The Argus Automatic Activation Device is fitted to the ICON Harness and Container as per the ICON Harness Container Manual TM162 (Technical Manual) all editions.
2. The Argus Automatic Activation Device is operated and maintained as per the Argus User Guide issued with the Argus Automatic Activation Device.
3. The Argus Automatic Activation Device is installed by suitably qualified personnel.
4. The Argus Automatic Activation Device has been tested and approved by Aviacom SA/NV for use on the Aerodyne, ICON Harness Container P125 and P120.

Any design changes to the Argus that effect the Fit, Form or Function of the AAD must be communicated to Aerodyne.



Dominic Hayhurst
Technical Director
Aerodyne

Karl Goorts
Leemveldstraat 42
3090 Overijes
Belgium

Dear Karl,

September 29, 2006,

We have reviewed the Argus AAD and have determined that it will physically fit in our Mirage Harness and Container System and are unable to find any incompatibilities to the functionality of our system.

We now approve the installation and use of the Argus AAD in Mirage Harness and Container Systems when assembled and maintained in accordance with the Argus owners Manual.

Sincerely,

A handwritten signature in black ink, appearing to read "Jeff Johnston".

Jeff Johnston
Quality Control Manager

Mirage Systems, Inc.
1501a Lexington Ave.
Deland Fl. 32724
Ph: 386-740-9222
Fax: 386-740-9444
jeff@miragesys.com
www.miragesys.com



velocity
SPORTS EQUIPMENT

February 18, 2007

Karel Goorts
Aviacom SA
Leenveldstraat 42
B-3090 Overijse
Overijse, VBT, Belgium

Dear Mr. Goorts,

Upon receiving the results of the Argus testing in the Infinity Harness/Container system, Velocity Sports Equipment is happy to approve the installation of the Argus AAD into the Infinity. The Argus does not appear to affect the normal operation of the Infinity Harness/Container system.

We do not assume any responsibility for the function of any automatic activation device.

Sincerely,

A handwritten signature in black ink, appearing to read "Kelly", with a long horizontal line extending to the right.

Kelly Farrington
President
Velocity Sports Equipment



Firebird GmbH + Co. KG - Am Tower 16 - D-54634 Bitburg

Aviacom SA/NV
Rue du chateau 48

B-1420 Belgium

FIREBIRD GmbH + Co. KG
Am Tower 16
D-54634 Bitburg

Phone: +43 (0) 65 61 / 94 96 80
Fax: +43 (0) 65 61 / 94 96 81

Email: info@flyfirebird.com
Web: flyfirebird.com

Datum: 28.02.07

**Use of Firebird Harness- Containersystems with
the ARGUS Automatic Activation Device (AAD).**

As long as the AAD fit's in the already in sewn setup pouch, housing and elastic cutter keeper and all wires and parts of the AAD can be stow away, the use of an ARGUS does not affect the useability of our Harness-Containersystem and the reserve parachute.

Firebird GmbH & Co. KG can not take any accountability for the safety, operability and reliability of any AAD. Also any cases of wrong mounted AAD or mistakes of packers/riggers in combination of any AAD devices with our parachute systems.

With regards



Bernd Pohl, chief director

Bankverbindungen / Bank Account:

Bank name: Volksbank Saarlouis
Bank code / BLZ: 593 901 00
Account no./ Kto.: 1000 000 112
Swift: GENO DE 51 SLF
IBAN: DE 25593901001000000112

Bank name: KSK Bitburg
Bank code / BLZ: 586 500 30
Account no./ Kto.: 65 979
Swift: MALADE51BIT
IBAN: DE 045865003000000659 79



The Future Of Harness and Container Technology...

AAD Information

RIGGING INNOVATIONS STATEMENT OF AAD COMPATIBILITY

AVIACOM ARGUS- APPROVED

Rigging Innovations in cooperation with the European Academy of Parachute Rigging and Research, have conducted 90 tests with the Argus AAD. These tests only dealt with the function of the cutter operation and packing techniques, in particular various loop lengths and materials. We DID NOT test the function of the AAD unit and software. Based on the results of the tests, Rigging Innovations finds the Argus AAD compatible with the following harness and containers.

- Talon 1, Talon 2, Talon 3.0/FS/FX, Voodoo
- Flexon, Genera, Classic, Classic Pro, Classic Pro 3.0
- Telesis 1, Telesis 2, Telesis 3.0

1. The Argus must be installed according to Rigging Innovations instructions.
2. The Argus must be in compliance with Aviacom Product Service Bulletin #SB AMM021206-1 and have the new cutter manufactured after November 2006.

http://www.rigginginnovations.com/AAD_Info.htm



Verband unabh. Prüfer v. Luftsportgerät e.V. – Ertlweg 1 – D 83677 Greiling

Aviacom SA
Mr. Karel Goorts
Rue du Chateau 48

1420 Braine l'Alleud
Belgien

Greiling, 12.03.2007

Re: Argus Type Certification

Dear Mr. Goorts,

when you were applying for the type certification of the Argus AAD no regulation was in force (at least in Germany) requiring the certification of an AAD, nor were test procedures or criteria. That means, as the LBA has stated, at that time it was solely the gear manufacturer's responsibility to test a possible interference with the safe operation of his equipment and to declare the Argus compatible with his equipment, if he decides so.

This means that is legal to use an Argus AAD and that a rigger can install an Argus into a harness/container system and pack the reserve where the manufacturer has given his approval and has issued a letter confirming the compatibility of the Argus AAD with his equipment. This procedure reflects the current legal situation and does not substitute a type certification (which wasn't possible at the time of the application). Neither does it supersede any future homologation requirements nor procedures should they become necessary.

Best regards,



Hans Ostermünchner
President
Prüferverband

Verband unabhängiger Prüfer von Luftsportgerät e.V. * Ertlweg 1 * D-83677 Greiling * Tel. 08041-70319
Eingetragen im Vereinsregister Bad Tölz * 1. Vorsitzender Hans Ostermünchner
e-mail: info@prueferverband.de * webpage: www.prueferverband.de



559 CHEMIN DES SALLES
83300 DRAGUIGNAN FRANCE

Tel : +33 (0)4 94 99 12 36 Fax : +33 (0)4 94 39 89 37 E-Mail : basik.fr@free.fr

Date: 12/08/07

Bonjour Karel,

Pour faire simple et aussi pour ne pas te pénaliser trop longtemps voilà ce que nous avons décidé.

Pour ma part je ne vois pas d'objection quant à l'installation de l'Argus dans nos matériels de la même manière que tes concurrents. Ce serait de la discrimination d'agir ainsi.

Cependant, je ne peux en aucun cas, comme tu peux le comprendre, endosser la responsabilité d'une non ouverture ou un retard d'ouverture à cause d'un de ces appareils, que ce soit l'Argus ou les autres marques.

Donc mon autorisation va être formulé de la manière suivante:

Suite à des tests effectués, Basik Air Concept autorise l'installation du déclencheur de sécurité Argus dans ses sac-harnais Advance (tous types). Le kit d'installation de la société Aviacom est recommandé (pochette-loop-pastille de verrouillage du loop) **et devra être fourni obligatoirement par Aviacom pour toute installation d'un Argus dans un sac-harnais Advance neuf. Ces kits seront mis à la disposition de notre usine (Ile Maurice) par quantité de 50 minimums.** Pour ce qui est des sac-harnais Advance déjà sur le marché nous ne pouvons contrôler si un utilisateur décide d'installer un Argus dans un de nos matériels, l'utilisateur prendra l'entière responsabilité de son installation dans le kit existant même s'il est de marque différente.

Nous ne garantissons en rien le bon fonctionnement de l'Argus dans nos matériels pour les raisons suivantes, même si à ce jour l'Argus n'a pas présenté de dysfonctionnement majeur:

Nous ne sommes pas des spécialistes en électronique

Nous ne pouvons affirmer que cet appareil remplira son rôle pour lequel il est dédié

Aucune certification officielle n'existe pour ce type de matériel

En conséquence nous autorisons à compter de ce jour l'installation de l'Argus de la société Aviacom dans nos sac-harnais Advance de tous types sans pouvoir en garantir le fonctionnement et ce pour la simple raison que les autres marques de déclencheurs sont autorisées sans pour autant pouvoir aussi garantir à 100% leur bon fonctionnement.

Jérôme Bunker

