



Galaxy GRS



GALAXY GBS 10 SERIES

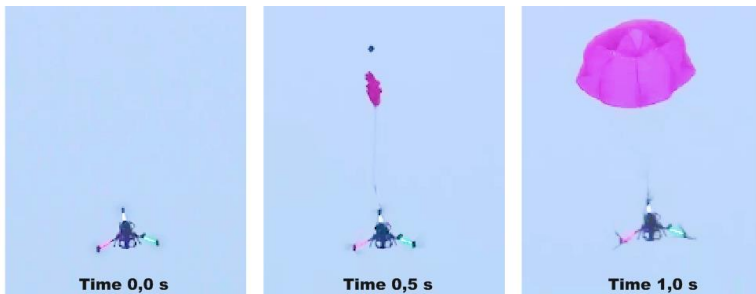
GBS 10/650

USER'S MANUAL

GALAXY GRS s.r.o. © 2020

1 INTRODUCTION

After more than three years of intensive development works by the company Galaxy GRS s.r.o. Liberec in cooperation with the Institute of aerospace engineering of the Brno university of technology and the company RCE systems s.r.o. supported by Indet Safety Systems a.s. we introduce you to a highly efficient ballistic rescue system **Galaxy GBS 10** for unmanned aerial vehicles (UAV). Thank you for trusting in us and we hope that you will never have to use the rescue system. We wish you a comfortable flight.



Function of GBS 10 system

2 TECHNICAL PARAMETERS

| TYPE | GBS 10/650 |
|------------------------------------|-----------------------|
| Carrying Capacity | 35-65 kg |
| System Weight ($\pm 3\%$) | 1400 g |
| Minimum Rescue Height | from 15 m |
| Speed | 0-80 km/hour |
| Way of Activation | 3x Pyro-actuator 350+ |
| Time to Complete Filling of Canopy | up to 1,5 s |
| Operating Temperature | -40°C to +70°C |

FOUND OUT EASILY WHAT SYSTEM IS MOST SUITABLE FOR YOUR UAV – USE COMPUTER PROGRAM ON www.galaxysky.cz

Note: When testing the undercarriage, observe the probable surface of impact influencing the absorption of dynamic shock at the drone impact on the ground (grassy surface x concrete surface)

During demanding development the emphasis was placed, especially, on **reaching very high performances** to which the whole structural proposal, design as well as the production of ballistic rescue systems of series **GBS 10** were subordinated.

The system, namely, excels in:

- **Minimum weight of rescue unit GBS 10/** in modifications **10/650, 10/650 Speedy**, each in the durable version **TOUGH G2** for professionals.
- **The lightest** ballistic rescue system in the world **in the carrying capacities 35-65kg!**
- **Quick opening** of rescue parachute by means of the pyro-actuator **up to 1,5 second** after the system activation /the system similar to the airbag in the car/.
- **Range of application from 35-65 kg** when using four sizes of ballistic equipment and five parachute canopies. An ordinary speed range and guaranteed opening is **from 0 to 80 km/hour**.
- **Minimum rescue height** – the safety height of application already in the range **from 10 to 15 m above the ground**.
- **GBS 10/650 Speedy** – the equipment is determined for fast flying models and drones up to the speed of **220 km/hour** with the time of opening **up to 3 second**. Minimum rescue height of this system is **40 m above the ground**.
- **Harm reduction** to your unmanned aerial vehicle, as well as **increased security on the ground** in the operational area of UAV.
- **Multiple system use** – simple process of putting the rescue unit into the operating status immediately after its field use in a very short time.
- **Usable range** for the system activation is identical with the range of your RC equipment.
- Ballistic equipment has undergone long-term testing in the **Institute of Aerospace Engineering VUT Brno** and it is **certified by the aviation testing laboratory**.
- Parachutes were designed on the basis of **measurement results in the aerodynamic tunnel in the Aerospace Research and Test Establishment (VZLÚ) Letňany** in order to reach the maximum stability and optimization of coefficient of resistance C_x .
- **TOUGH version is certified** according to applicable requirements **RTCA/DO-160G** (Environmental Conditions and Test Procedures for Airborne Equipment) guaranteeing system functionality under extreme conditions such as the **temperature range -40°C to +70°C, atmospheric humidity 95% at 55°C, rain, increased dustiness, etc.**
- Developed unit is protected by two patents and several utility models filed on the ballistic rescue system itself and the parachute.
- **Easy installation** of ballistic equipment and electronics on any UAV system.
- The device can be optionally supplied with **Engines Switch** to switch off the UAV engines with regard to the status of the safety lock and the parachute. **It serves to switch between the primary and backup flight control systems.**
- **Safety interlocking** for the transport of prepared **UAV** with an installed unit, as well as individually transported units with the installed **safety shorting fuse** and the light and acoustic indication for the unit Stand-By mode before take-off.
- **Service** and production of the unit in **Galaxy GRS in Liberec** – the company with **35 years tradition** with parachute ballistic systems.



3 SAFETY RULES

When handling the system and also during its use always pay increased attention and observe following **SAFETY RULES**. Their omission or failure to comply with may result in the bodily injury or property damage.



- Before handling the ballistic rescue system always disconnect the power source.
- Before handling the ballistic rescue system always lock the system by means of shorting fuse.
- Ballistic rescue system prepare for operation just prior to take-off. In case you want to manipulate with system, disconnect the power supply and repeat the initialization procedure.
- During system charging always use protective glasses and gloves.
- Check the entire system before the power source is connected.
- Shift the lever on RC transmitter to the lower position and switch on RC transmitter and RC receiver before the power source is connected.
- Use only RC receivers working on 2.4 GHz.
- Never lean over the container with the pyro-actuator.
- Never point the container with the pyro-actuator either against any living person or against yourself.
- Before flying trigger the system by pulling out the shorting fuse.
- Pay increased attention during the flight.
- Lock the ballistic rescue system by means of the shorting fuse after landing. Then disconnect the power source.
- Always lock the ballistic rescue system by means of the shorting fuse during storing.
- Always lock the ballistic rescue system by means of the shorting fuse during transportation.
- The shorting fuse is the only and safety way how to prevent an intended or unintended system activation (launching the emergency parachute).
- Do not operate the system in close vicinity of potentially explosive area, for example, gas pipelines or gas storage, etc.
- For activation of system GBS 10/350 always use pyro-actuator 350 only!

In inappropriate or improper handling an unexpected activation of the control module and launching the emergency parachute may occur. Pay increased attention during using or handling the system. Check regularly electronic modules (cabling, connectors and their any possible damage). Check the mounting of the system and electronic module to the airframe before each flight.

Connect electronic modules only according to the manufacturer's instructions.

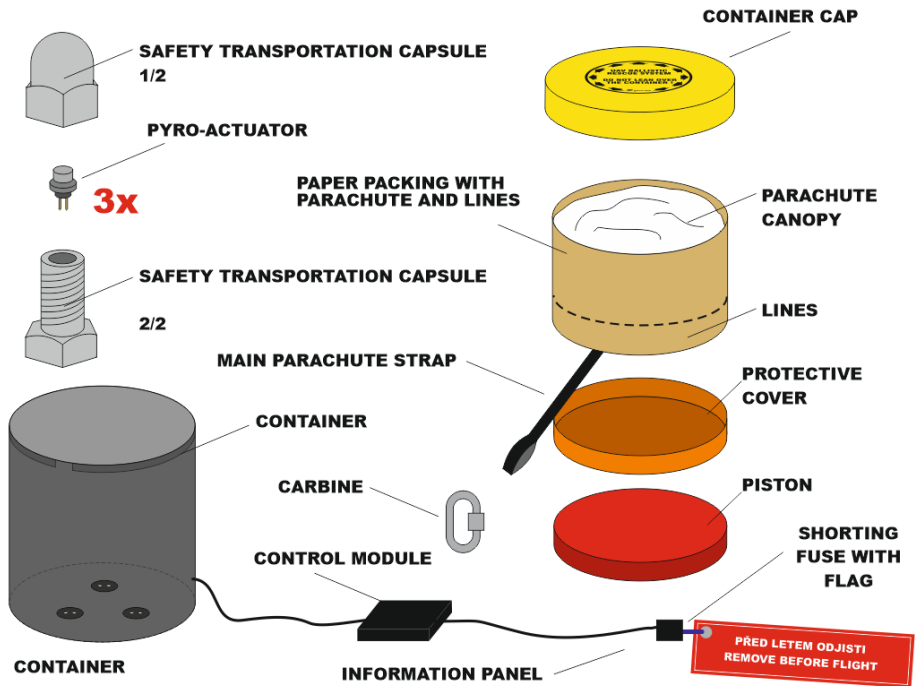
The manufacturer is not liable for any damage caused by improper handling!



The product, when properly installed and when used in compliance with the procedure for handling and storage, reduces significantly the likelihood of UAV and airborne equipment damage in case of UAV drive or remote control failure. In any case the user is not entitled to infringe legislative restrictions for the operation of unmanned aviation vehicles, for example, in densely populated areas, etc. Even despite the small planned impact energy the product is not capable with 100% probability to prevent any damage caused by the unmanned aerial vehicle crash. Observe the national legislation for the operation of your UAV. GBS 10 product is based on using the latest technology and components applied in aerospace, space and automotive industries. Like an airbag in a car reduces significantly the consequences of eventual traffic accident, but is not able to prevent injuries in all cases and does not entitle the driver not to obey the law, the GBS 10 system enhances security payload in your UAV and reduces the risk of damage during the fall. The system, however, is not able to completely prevent any damage or injury, and the manufacturer is not liable for them.

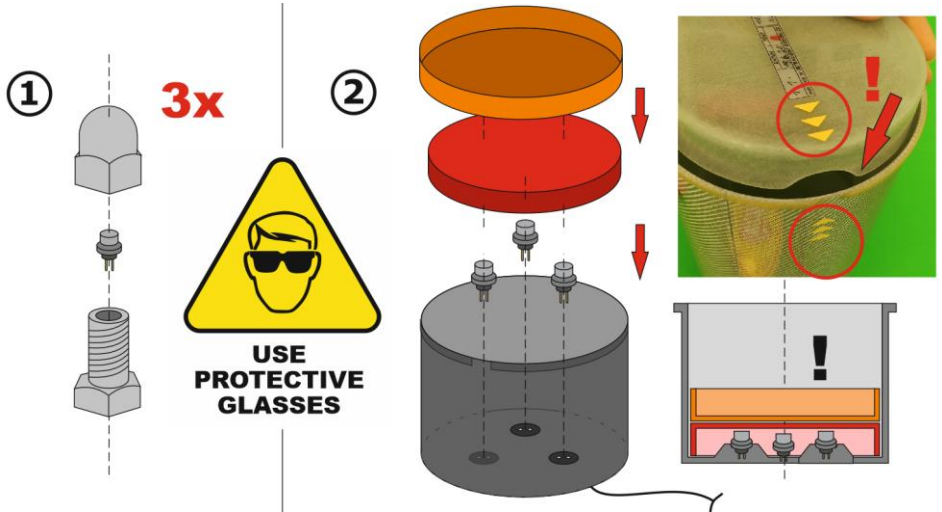
Galaxy Holding s.r.o. as a seller is not liable for any damages or injuries resulting directly or indirectly from the use of this product, or any other possible damages arising from the fall or operation of the unmanned aerial vehicle!

4 PACKAGE CONTENT

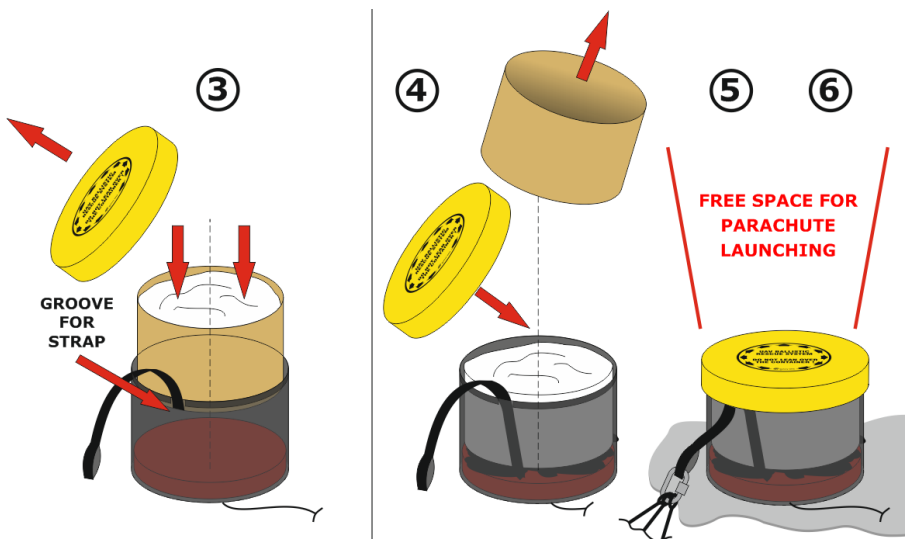


5 SYSTEM CHARGING AFTER UNPACKING

- 1) Each system charging should be carried out in the **dry surroundings!** Unscrew the safety transportation capsule and **take out the pyro-actuators** - **when taking out the pyro-actuators** from the transport capsule **you are obliged to use protective glasses**. Before handling we recommend to ground both the safety capsule and the hands by grasping the capsule by hand and putting the hand with the capsule on the grounded object (such as a grounded table, space heater, metal body of water taps, possibly also on soil or grass) and to keep in the contact for the period of minimum **3 seconds**. The complete information can be found in **Annex No. 1**
- 2) Insert the 3x pyro-actuator into the socket in the bottom of the container and then insert the piston **(RESPECT THE YELLOW ARROWS – POSITION OF THE GROOVE!)**. Observe **SAFETY RULES** (see Chapter 3)!



- 3) **Remove the lower embedding cap of the container.** Attach the paper packing on the container top and squeeze the parachute with lines and orange protective cover through this packing inside the container. Direct the main parachute strap into the groove in the reinforced upper edge of container rim and leave its end outside the container for the carbine connection.
- 4) **Remove the paper packing,** put on the container cap on the cylinder top.





- 5) **Fasten the container** as close as possible to the centre of your UAV by 3x bolt through the bottom (ANNEX 4). It is recommended to have a rigid support from the bottom of container. **Above the container shall be no obstruction** that would prevent the safe deployment of the parachute. In case of internal installation of the ballistic rescue system **use the canopy (cover) authorized by the manufacturer**. The canopy must pass the test ensuring the safety passage of launched parachute.
- 6) **Connect the end of the main parachute strap with the suspension system** (system of straps, ropes, etc.) **by means of carbine**. The UAV should descend in the horizontal position.
- 7) Fasten the information panel with the shorting fuse so that the **shorting fuse is in the conspicuous and accessible place**.

6 ELECTRONIC SYSTEM

Instructions for electronic system installation can be found in separate manual which is included in the package and its version varies according to the type of control electronics supplied.

7 SYSTEM RECHARGING AFTER ITS ACTIVATION

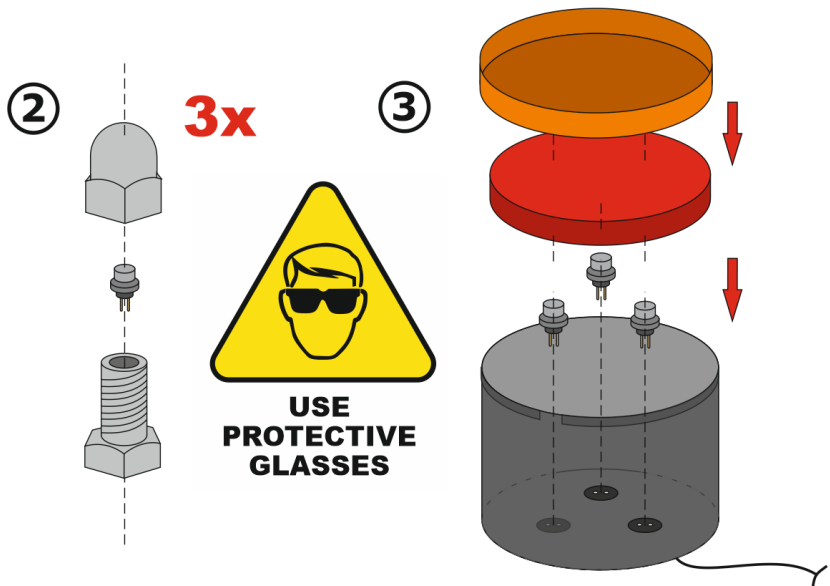
After each use of the rescue system it is necessary to check all parts of the assembly, mainly the cylinder, piston and electronic modules including their interconnection **see Chapter 9**. In case of any damage contact the manufacturer. Provided the system is without any damage, you can start to recharge it. Make the record in the table - **Annex No. 3**. **Observe SAFETY RULES (see Chapter 3)!**

7.1 System Recharging Procedure

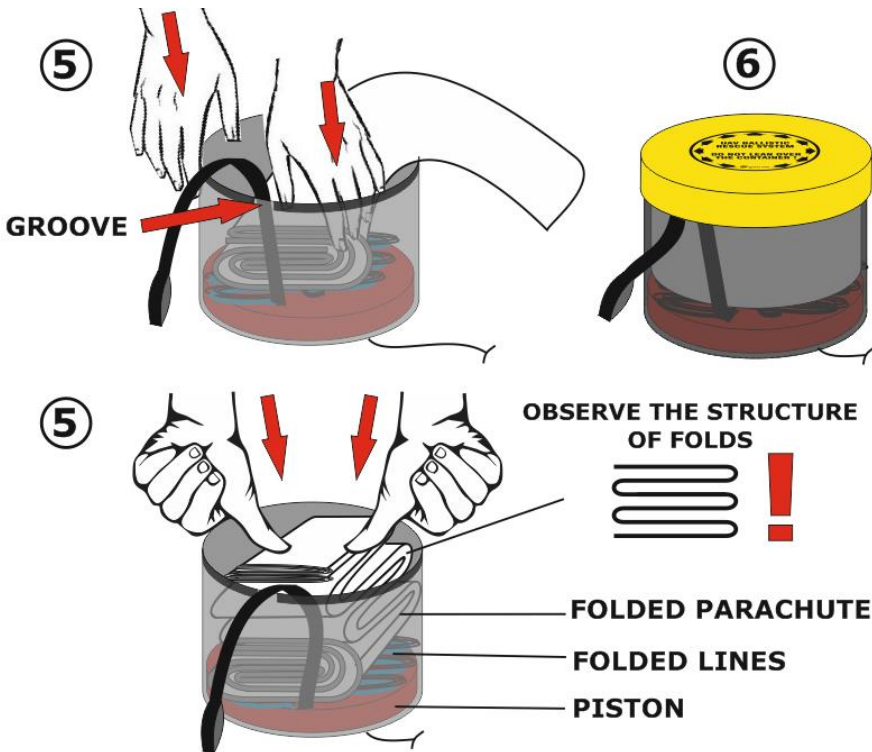
- 1) Remove the 3x used pyro-actuator from the socket in the bottom of container.
- 2) Unscrew the safety transportation capsules and take out 3x pyro-actuator – when taking the pyro-actuator out, observe the rules according to **Chapter 5 Item 1**).



- 3) Insert the pyro-actuator into the socket in the bottom of container and then insert the piston. **Observe SAFETY RULES (see Chapter 3)!**
- 4) Pack the parachute with lines carefully according to **Chapter 7.2**.
- 5) Insert the carefully folded lines inside the container protected by orange protective cover. Direct the main parachute strap into the groove in the reinforced upper edge of container rim and leave its end outside the container for the carbine to be connected. Press the folded parachute gradually with your hands – the best with thumbs – inside the container in the form of „harmonica“, starting from the bottom part of parachute according to figure 5.
- 6) Put the cap of container on its top
- 7) Fasten the container on your UAV by means of the Velcro fastener.
- 8) Connect the end of the main parachute strap with suspension straps by means of the carbine.
- 9) The system is charged and prepared for the next use.

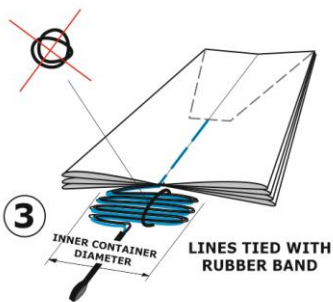
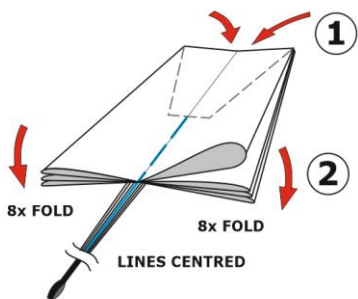


PACKING OF PARACHUTE 10/650 HELI is described in different document !

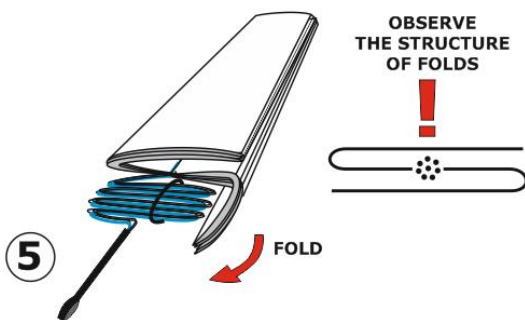
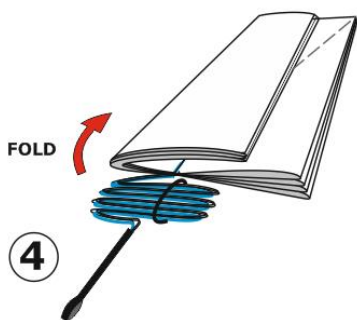


7.2 Parachute Packaging

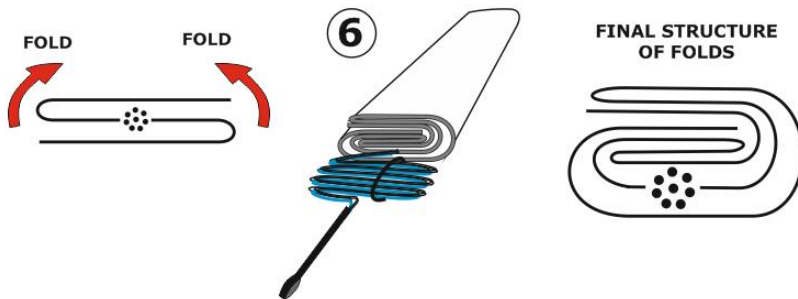
- 1) Check whether **there was no damage on the parachute, lines or the main parachute strap** during the rescue of your UAV. Make sure that the lines are loose (they do not cross) and tighten them all (including the central line leading to the upper parachute opening). Thus the upper part of the parachute falls inside the parachute. Check whether the parachute is not damp or wet.
- 2) The parachute has 16 cells. Fold each cell in half so that all the lines come out from the centre of the parachute and divide the folds in the ratio 8:8.
- 3) Fold the tighten and aligned lines in the form of „harmonica“ and lock them together with a thin rubber band according to the figure. Do not fold the rubber band – rather looser enlacement! The length of folds should be approximately equal to the container diameter.



- 4) 2/3 of the **left** folds fold toward the center of the parachute.
- 5) 2/3 of the **right** folds fold toward the center of the parachute, but on the opposite side. Lines must still be centered relative to the **parachute**.



- 6) The left and right part of folded parachute fold over each other according to Figure 6. It is important to **preserve the structure of folds!** Now the parachute is ready to be pressed into the container. Continue in the procedure with Item 5) in Chapter 7.1



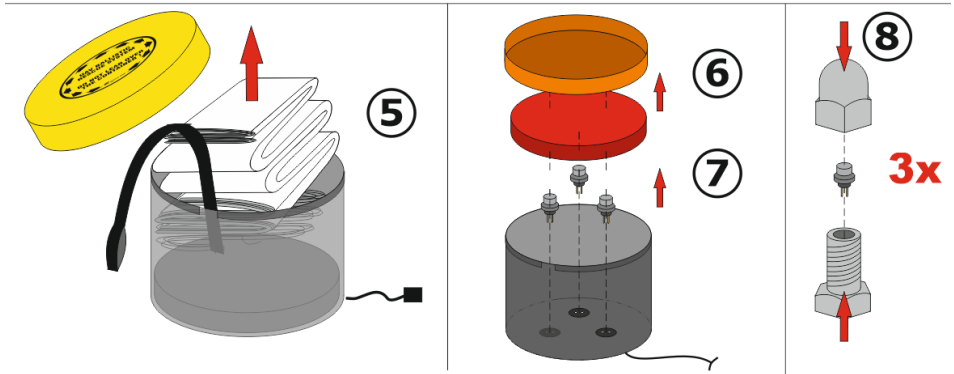
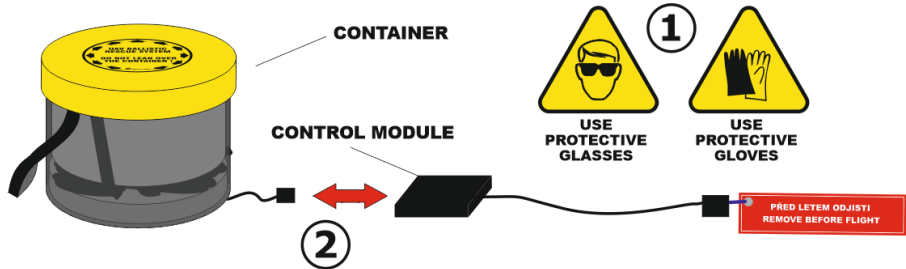
8 PROCEDURE FOR SYSTEM FAILURE

Despite of all the efforts put into the reliability of the system in the course of its development, absolutely exceptionally a situation may occur when the system does not respond to the transmitted signal to activate it. In such a case proceed according to the following steps. It is necessary to identify the cause of failure. The pyro-actuator itself is tested with extreme requirements as to its reliability and therefore it is necessary to exclude other more likely potential causes of system failure before its disassembly. If the crash of the unmanned aerial vehicle with the ballistic rescue system on board takes place, be very careful upon the inspection after UAV hitting the ground. Keep away from the system in the direction of potential parachute launching, i.e. in the direction towards the container cap.

Do not switch off the RC transmitter before coming to the wireless UAV equipment. After coming check the information panel – whether it signals the system running (blinking of green/red diode, possibly acoustic signalling). Make note of this information. Only then disconnect the power source from the unmanned aerial vehicle and subsequently the RC transmitter.

- 1) Check whether the shorting fuse was removed before the take-off. If not, the system was OK.
- 2) In case the control module and information panel have not been mechanically damaged, disconnect it and subsequently check the function of both modules according to Items 6.4 and 6.5 of this User's Manual. Provided the unit responds to the signal for launching according to Item 6.5, the control unit is OK.
- 3) In case any of the modules has been damaged, send it to the manufacturer with the description of the event.

In case no cause of failure has been found out during the inspection carried out according to Items a) and b), it is necessary **to dismantle the 3x pyro-actuators** from the system and send it to the manufacturer in the original packing. The procedure of dismantling is as follows:



- 1) Prepare protective glasses, gloves and the tool for removing the pyro-actuator (combination pliers as the best).
- 2) Disconnect the control module from the rescue system(connector PYRO)
- 3) Make access to the container with the rescue system. **DO NOT LEAN OVER THE CONTAINER!**
- 4) Remove the container cap.
- 5) By gradual pulling remove the packaged parachute from the container.
- 6) Remove the piston from the container.
- 7) Using the pliers remove the pyro-actuator carefully from the socket.
- 8) Insert it to the safety transportation capsule and lock it by screwing.
- 9) Send the pyro-actuator to the manufacturer.

9 WARRANTY AND CONSUMER TIME

Warranty period is two years from the purchase of GBS10 system. The date of purchase and date of manufacture of the ballistic rescue system are marked out in the warranty certificate.

Service life – The system is possible to be used repeatedly. In the course of testing the rescue unit was loaded with a series of seven launches without any damage. To ensure the proper function of the ballistic rescue system, it is necessary to carry out regular inspections of all parts of the assembly not only after launching, but also during the use of the unmanned aerial vehicle (influence of vibrations, dynamic impacts when landing, etc.)

The manufacturer recommends carrying out the inspection of these parts:

| PREVENTIVE INSPECTION | INSPECTION AFTER SYSTEM ACTIVATION |
|---|--|
| <ol style="list-style-type: none"> 1) Electronic modules – inspection of cables, plugging of connectors and their possible damage 2) Fastening of the system and electronic module to the UAV airframe 3) Joining the main parachute strap with the suspension system (straps, lines) 4) Inspection of the suspension system in the UAV suspension points 5) In the direction of the rescue parachute launching shall be no obstruction or, for example, part of installed on-board equipment or any cables 6) Inspection of container cap closure tighten with the Velcro fastener | <ol style="list-style-type: none"> 1) Detailed inspection of the internal and external parts of container 2) Piston inspection 3) Parachute inspection 4) Inspection of parachute lines and the main parachute strap 5) Inspection of suspension system – possible damage from rotors 6) After recharging – all steps from the preventive inspection |

In case of any damage or doubts do not hesitate to contact the manufacturer.

Spare parts and accessories may be purchased directly from the manufacturer.

10 STORING

Optimal storing temperature is **14 –24 °C** with air humidity 35-73%! Ballistic rescue system is designed for the limiting values of use from **–20°C to +40°C!** Nevertheless, we cannot recommend permanent exposition of the system to these temperatures and exceeding **the recommended humidity values** during storing!

The manufacturer prohibits to expose the system to high temperatures, hard impacts, mechanical damage, acids, aggressive chemicals, long-term storing in excessive humidity and permanent vibrations!

Warning – The system must be handled as pyrotechnic equipment and any person is prohibited to move in the direction of parachute launching, or to aim at his own body with the unlocked system!

11 TRANSPORT

The safety transportation capsule serves for the safety transport of individual pyro-actuator pieces with the maximum portion of pyrotechnic charges up to 500mg and in compliance with the documentation ISV 2198, according to which the capsules were certified by the notified European testing laboratory (No. 1395, Konštrukta Defence a.s., Slovakia). Thanks to this it is possible to transport the product by means of the classical mail as the explosion-proof equipment. Based on fulfilling the prescribed legislative UNO conditions for declassification of the product from the exclusive Class 1 for the transport of dangerous goods there was issued Resolution No. SK/KTD018/14 the copy of which you may find in **ANNEX NO. 2**. The product cannot be transported via air transportation and it is subject to special provisions in the territory of the USA. For further possibilities of transportation and the transportation in the USA contact the manufacturer.

ANNEXES

ANNEX NO. 1 – Safety Transportation Capsule for the transport of pyro-actuator – manufacturer ISS a.s.



Use

Safety transportation capsule is used for the safe transportation of individual ISS's pyrotechnic products with the maximum amount of pyrotechnical charges up to 500mg and in compliance with the documentation ISV 2198 submitted to the certification process by European Notified Testing Laboratory (No. 1395, Konštrukta Defence a.s., Slovakia). Based on fulfilling the prescribed UNO legislative requirements for the declassification of dangerous goods from Class 1, there was issued Resolution No. SK/KTD018/14.

The copy of this document must be attached to each delivery of products in the safety transportation capsules.

Description of Product and Safety Measures:

Safety transportation capsule is composed of screw body with an internal cavity for installation of non-detonating pyrotechnic article and of threaded cup. The cup and body are screwed tightly together using 2 spanners or other suitable tools. Subsequently the capsule containing the squib is packed and as a standard mail delivery can be transported by standard delivery services like Post as non-dangerous goods. Attention! This information is not valid for the U.S. territory where an additional approval from DOT is required. Filling of capsules with squibs is done by the manufacturer.

Upon removing the squib from the safety capsule always wear protective glasses (dioptric or sun glasses are enough). We recommend effectuate grounding of safety capsule and operator's hands by touching grounded metal objects (like grounded metal table, space heater, metal body of water taps, possibly also on soil or grass) and to keep in the contact for the period of minimum **3 seconds**. After this procedure you can disassemble the safety capsule by means of two socket spanners or other suitable aids and remove the pyrotechnic squib for the next use.

The safety transportation capsule may be used repeatedly (as returnable packaging) provided that in terms of using it is not excessively worn out, or corroded, which

prevents easy disassembly or safety removal of its content. When the product is removed from the safety capsule, it is again categorized as a pyrotechnic article for other uses of category P1 (with low hazard) in compliance with the valid regulations of the European Union. Its acquisition, handling or use could be treated under the specific legislation in the country of use. Fulfilling of these requirements is always a responsibility of the distributor and user of our products.

Important additional information:

Attention! The use of safety capsule does not exempt from the obligation to observe the legislation for the pyrotechnic articles in the user's country. The safety capsule is only the approved means for the safety transportation of pyrotechnic articles! Indet Safety Systems a.s. prohibits all and any adjustments of safety capsules. Any other use than prescribed and approved of is strictly prohibited. In case of any breach of these regulations and instructions mentioned above the company Indet Safety Systems a.s. assumes no responsibility for the caused damage. If needed, please, contact us at phone No. +420 571 425 001 or by e-mail info@iss-cz.com.

**ANNEX NO. 2**

KONŠTRUKTA – Defence a.s.
Prevádzka špeciálneho skúšobníctva, 018 41 Dubnica nad Váhom
Autorizovaná osoba SKTC – 112

ROZHODNUTIE č. SK/KTD018/14
Resolution № RZ – SK/KTD018/14

o deklasifikácii nebezpečných vecí triedy 1 – Výbušniny v zmysle Európskej dohody o medzinárodnej cestnej preprave nebezpečných vecí (ADR).
on declassification of dangerous goods of Class 1 – Explosives in sense of International Transportation of Dangerous Goods by Road (ADR).

Toto rozhodnutie sa vydáva na základe poverenia Ministerstva dopravy, pôšt a telekomunikácií Slovenskej republiky č.j. 9 – 101/2003 zo 07. 02. 2003 a na základe žiadosti spoločnosti:

This resolution is issued according to the authorisation by Ministry of Transport, Posts and Telecommunications of the Slovak Republic № 9 – 101/2003 dated 07.02.2003 and on the base of application of the company:

Indet Safety Systems, a.s.
Bobrky 462
755 01 Vsetín
Česká republika
Czech republic

Názov látky alebo predmetu: Nedetonujúce pyrotechnické predmety s hmotnosťou pyrotechnickej zlože do 500 mg
Name of the substance or article: *Non-detonating pyrotechnic articles with weight pyrotechnic composition up to the 500 mg*

Výrobca: Indet Safety Systems, a.s.
Manufacturer: Bobrky 462
755 01 Vsetín
Česká republika
Czech republic

Nedetonujúce pyrotechnické predmety s hmotnosťou pyrotechnickej zlože do 500 mg, v transportom puzdre, ktoré je vyrobené podľa dokumentácie ISV 2198, sú vyňaté z UN triedy I pretože nepredstavujú značné nebezpečenstvo výbuchu v súlade s „UN Recommendations on the Transport of Dangerous Goods - Model Regulations, Seventeenth revised edition 2011“ bod 2.1.3.6.4.



Non-detonating pyrotechnic articles with weight pyrotechnic composition up to the 500 mg, in transport housing, which is made according to documentation ISV 2198, are excluded from UN Class 1 and designated as not presenting a significant hazard from explosion in accordance with „UN Recommendations on the Transport of Dangerous Goods - Model Regulations, Seventeenth revised edition 2011“ point 2.1.3.6.4 .

Vyššie uvedená deklasifikácia platí tiež pre dopravu výbušnín podľa IMDG, ICAO TI, RID a ADN.

The above mentioned declassification is also valid for transport of explosives according to IMDG, RID, ICAO TI and ADN.

Dátum a miesto vydania: 11. 12. 2014, Dubnica nad Váhom

Date and place of issue:



Ing. Daniel Nemček
riaditeľ SKTC – 112
Director of SKTC – 112

063581

ANNEX NO. 3 – RECORD OF SYSTEM USE

The manufacturer recommends recording every use of the system including the entire system inspection carried out, especially, in case that the unmanned aerial vehicle is operated alternatively by more persons.

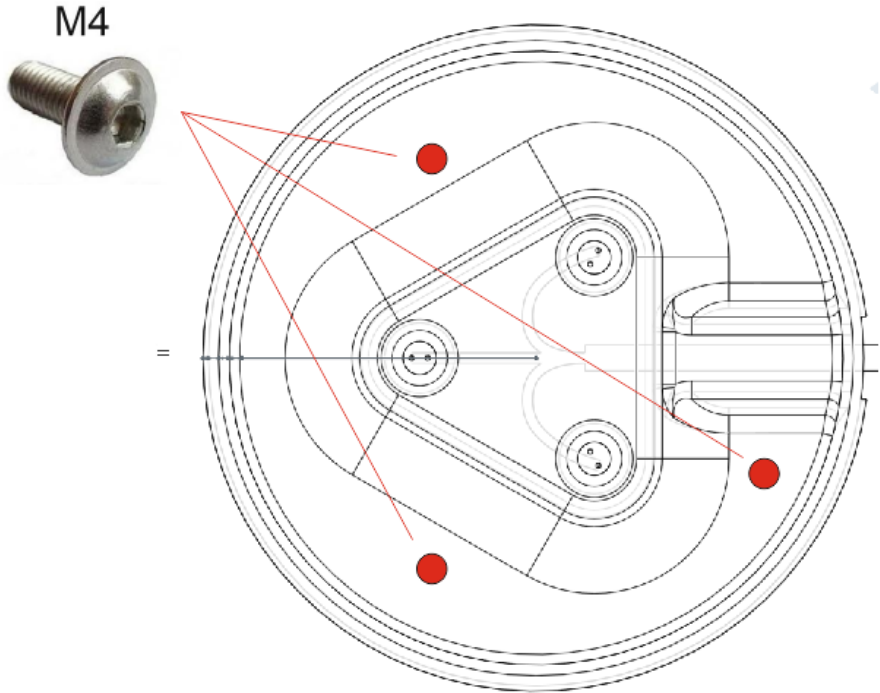
| NUMBER OF USES | DATE | INSPECTION CARRIED OUT | SIGNATURE |
|----------------|------|------------------------|-----------|
| 1. | | | |
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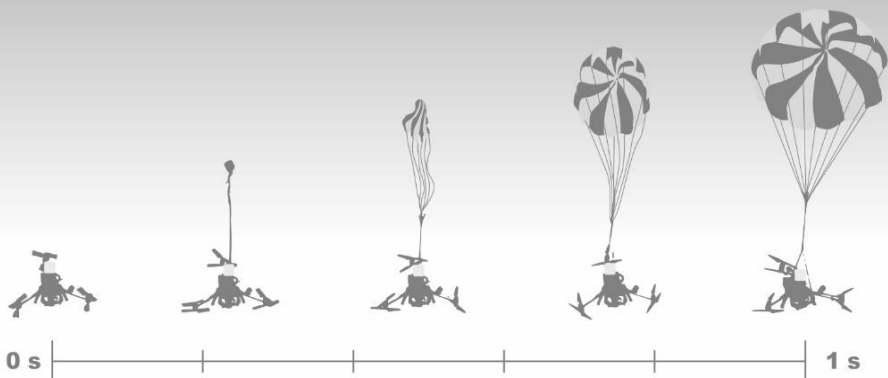


ANNEX NO. 4 – EXAMPLE OF CANSITER INSTALLATION

TOP VIEW



Use bolts with flat head to make the burning chamber under the piston tight



**RESCUE YOUR UNMANNED
AERIAL VEHICLE WITH
THE GALAXY GBS 10
UP TO 1 sec.**



**GALAXY HOLDING
Třída 1.máje 24/a
460 01 Liberec 3
Czech Republic**

www.galaxysky.cz