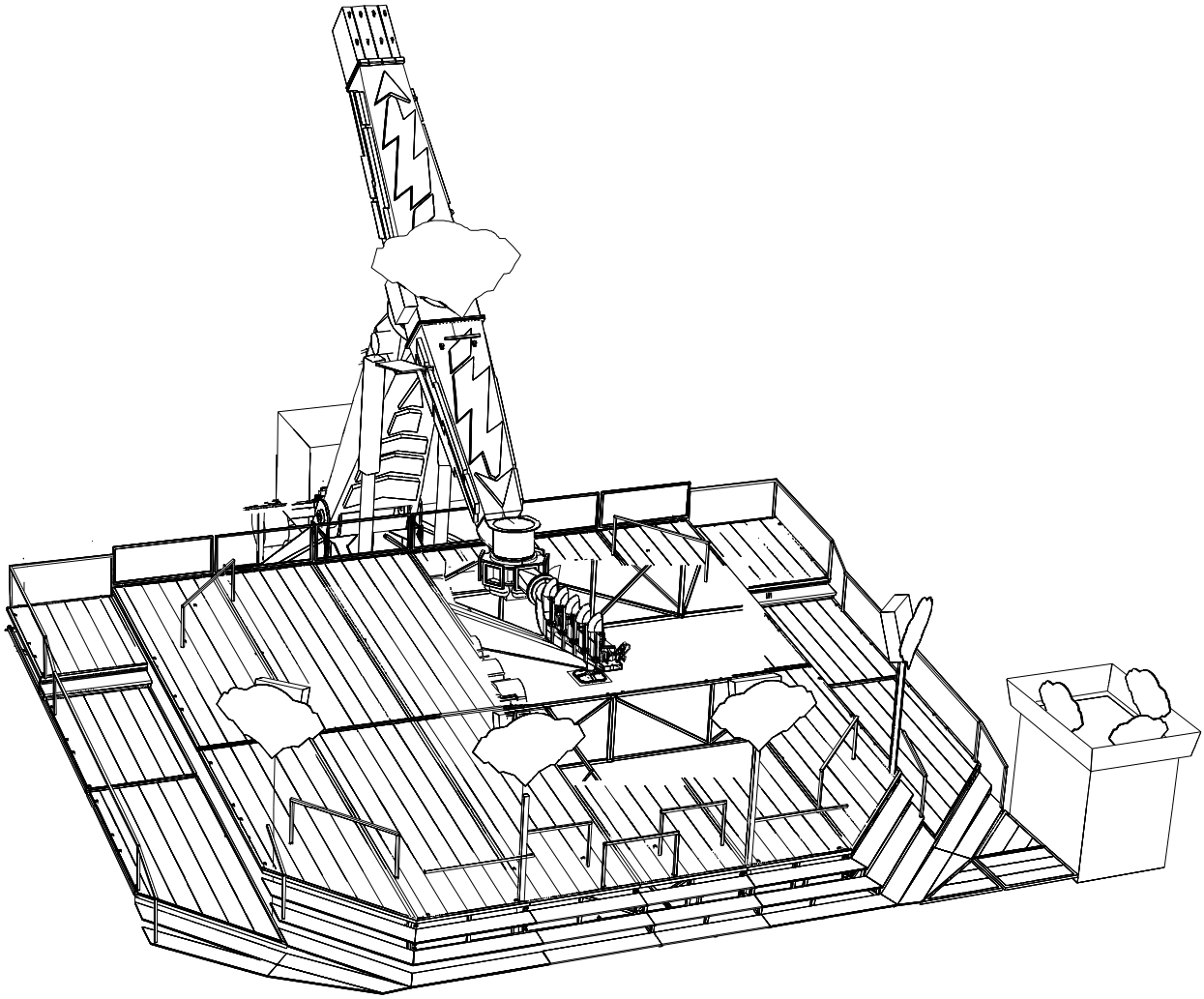

Operating and maintenance manual

Topscan

MONDIAL

Preface

This manual contains important information about the use and maintenance of the Topscan.

We emphasize that the advice and instructions given in this manual should be followed. We further advise that the first service and checks are carried out by our specialist mechanics. This ensures that the Topscan is in good operational condition and that the guarantee can be fully safeguarded. Experience has shown that this is also an excellent opportunity to inform the operating and maintenance staff. Also possible questions can be directly answered.

This manual describes the technical background of the Topscan at the time of printing. The manufacturer reserves the right to carry out improvements without having to simultaneously impart this via the manual. This entails that the technical specification, drawings and descriptions are not binding.

For further information or technical support, we kindly request you to contact the supplier:

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1 Short description and operation

This ride consists of a main mast with a drive on which an arm is mounted in an angle of approximately 45 degrees to the mast. The variable hydraulic drive enables the main arm with the gondolas to rotate to the left and to the right. The gondola cross which is assembled in a star form, consists of six gondola arms, upon which five suspended seats are mounted and equipped with the Mondial “triple lock” Super Restraint System. The gondola cross rotates to the left or to the right and is driven hydraulically.
The gondolas are allowed to move freely using centrifugal force.

The platform is static, the main mast lowers to load and unload the gondolas. Two hydraulic cylinders are used to move the mast up or down, it will lift in 10 seconds. The platform is equipped with fences and the special **TOP***Step*® anti skid aluminum profile.

The ride is provided with a system control panel. The operations of the main arm and gondola cross are limited for over speed. The restraints are monitored during the ride cycle. On each gondola an operator panel is mounted to open and close the restraints; every seat has its own light that indicates that the restraint is closed. The ride is provided with an automatic parking system to put the arm in zero position and lower the mast automatically.

The seats and the restraint are made of black PUR foam on a solid metal frame, shaped in a way that it is suitable for a wide range of body profiles.
Every seat is equipped with the Mondial “triple lock” Super Restraint System. The restraints are double locked mechanically and blocked hydraulically. The restraints open and close pneumatically. During the ride cycle the restraints are monitored.
During loading and unloading the arm safety brake is activated to prevent movement caused by unequal loading.
In case of a power failure an emergency battery can be used to operate the drive.

There is no upper height limit but the passenger has to sit straight and the restraint has to be closed tight to the body. For checking the minimum height, measuring devices need to be available at the entry of the ride. Passengers need to have natural upper legs including the knees.

Passengers with spinal complaints, high blood pressure, heart problems, pregnant women and persons under the influence of alcohol, drugs, medications or other narcotics may not ride on the Topscan.

At the ride, safety warnings have to be placed. This is the responsibility of the operator.

Before the passenger takes a seat on the gondola, he or she has to remove from their person any loose objects, such as bags, scarves and other objects. These objects may be put on the edges of the platform of the Topscan. Domestic pets are also barred from the Topscan.
When the passenger takes a seat, he or she has to sit properly in the seat with the back fully supported. The passenger has to place one leg on each side of the pommel protuberance (node). The passenger has to place hands and arms around the (seat) restraint so that the restraint is properly positioned against the body. (See appendix A2 figure 1) The passenger has to put his hands on the handgrips of the restraint.

The operating staff has to ensure that the passengers are safely seated, and they have to check every restraint individually by pushing and pulling to check if it is tight against the body and to check if the restraint is hydraulic and mechanical locked.

The operating staff has to ascertain that the Topscan can safely operate. They also have to ensure that no persons or animals are within the safety fencing while the Topscan is operated.

The Topscan is provided with an emergency battery. The battery has to be tested on a daily basis. If this test fails, the Topscan may not operate or be brought into operation before the battery is recharged.

The Topscan has to be checked on a regular basis according the local regulations.
Nothing may be altered or changed to the Topscan without written permission of Mondial.
No drilling or welding may be done on the Topscan without written permission of Mondial.
Mondial cannot guarantee the operating lifespan, rust-free condition and safety if the Topscan is altered or modified without explicit written permission. The complete ride is tested by the TÜV. All recommendations from the TÜV have to be followed up.

1.1 Safety during operation

1 The ride parameters set at the final inspection, such as acceleration speed, maximum speed, etc. may not be altered!

2 During operation the operator position needs to be constantly occupied by a trained, skilled, person who is at least 18-years old.

3 During the ride sequence no personnel or public may be present in the danger zone (inside the perimeter fence).

4 At least 1 member of staff must be present at the entry and exit gate.

5 When the passengers take their places, the staff must ensure that the passengers are sitting properly with their back fully supported and that they have a leg on either side of the pommel protuberance (node). The staff also has to supervise that the restraint is positioned tight against the body, after closing the restraints. No objects may be present between body and restraint like bags, folded clothes etc. Finally the passengers have to grasp the handgrips around the restraint.

6 The operating staff shall observe the ride and the passengers constantly.

7 People smaller than 1.40 meters (55 inches) and/or younger than 12 years and people that don't have natural upper legs and knees may not ride the Topscan.

8 People with spinal complaints, high blood pressure, heart problems, pregnant women and persons under the influence of alcohol, drugs, medications or other narcotics may not ride the Topscan.

9 Loose objects as bags, hats / caps, glasses must be taken off (and put on the platform)

10 The directions 7,8 and 9 have to be made clear to passengers by means of signs at the entry of the ride and by verbal instructions form the attendant.

2 Transport and erection

The Topscan is transported on at least two transports. 1 Trailer integrated in the Topscan containing the mast, the arm, the chassis, the main drive and the supports and 1 transport containing the gondolas and the platforms etc.

For erection of the Topscan, the following equipment is necessary:

- Hoisting crane ± 25 tons metre
- Hoisting equipment such as D-shackles, belt slings, 2 tandem hops, 4 tooth –hops.
- Tools such as closed end spanners/wrenches, torque wrenches, levels, laser length meters.

The buyer will supply these tools.

2.1 Erecting the Topscan

Valves named in paragraph 3.1 and 3.2 are named in appendix A1 drawing 115-05-246 or 247 and their location is shown in appendix A2 figure 2

Manoeuvre the middle construction (trailer) into the correct location. Fit the front and rear supports. Place the wooden prop boards and support plates underneath the ends of the supports and adjust to the correct height (see Appendix A1 drawing 115-05-384). Now allow the middle construction (trailer) to lower onto the support plates.

Raise the mast slightly with the remote control (appendix A2 fig. 4), after turning valve no.8 into ‘set up’ position, using the hydraulic cylinders, so that the working platform can be fitted onto the arm. Now raise the mast fully. The gondola arm is now pulled up slightly using a mobile crane or similar, a steel cable and a snap block (roller), so that the bolt used to fixate the gondola arm to the mast can be removed. Now pay out the cable until the gondola arm hangs freely. The mast can be lowered slightly. The steel cable is now pulled in such a way that the flange of the gondola arm is pulled against the flange of the hub. Now place a ladder on the gondola arm and fit at least four bolts on the front in order to fasten the flanges.

Open valve no.6 of the hydraulic unit so that the gondola arm can move freely. When turning the gondola arm using the mobile crane the brake must be released. To release the brake see 5.1. Turn the gondola arm and the hub through 90° using the crane and then lower the mast again. Allow the end of the gondola arm and hub to rest on a frame.

Fit the counter-arm and, after closing by-pass valve no.6, raise the mast again. The hydraulic lifting cylinders now need to be locked mechanically by turning the locking discs and fasten them. Turn the gondola arm with the hub to 180° so that the counter-arm is at the bottom. Fit a 3.8 T counterweight. Turn arm and hub back to 0° and fit two gondolas. The further sequence of assembly is 2.5 T counterweight > 2 gondolas > 3.7 T counterweight > 2 gondolas > 2.5 T counterweight. A torque wrench is necessary up to 750 bar placed on the bolt side.
Put valve no 8 into ‘operation’ position.

2.2 Constructing the platform

See drawings of the platform appendix A2 figure 3.

Place the part of the support, indicated on the drawing by ‘Mark 1’, which is beside the front-support legs, on the appropriate stays at the chassis. Lock this part of the support using two ‘Mark 1’ struts which run towards the chassis.

Suspend support parts, Mark 2 and 3, on both sides of support, part Mark 1 and prop up with wood in such a way that it is exactly horizontal (for propping up see drawing 115-05-276). Also fit struts Mark 2 as well as Mark 3 and Mark 4 between support part Mark 2/3 and the chassis. Hook in support part Mark 11 and 12 (mirror image) to the frame Mark 2 and 3. Prop these up until they are horizontal.

Fit support part Mark 4 using strut Mark 5 and adjust to the correct height. The underside of the support part is to be at the same height as the underside of support part Mark 2 or 3. Now fit auxiliary strut Mark 10. Suspend support parts Mark 5 and 6 on both sides of the support part 4 and prop them up such that they are precisely horizontal. Fit the auxiliary supports and hook support part Mark 11/12 into support part Mark 5/6. Hook supports part Mark 13 and 14 at 90° into the frame Mark 5/6. Prop them up until they are horizontal.

Fit support part Mark 7b using struts Mark 7 and 8 and auxiliary support Mark 11 and adjust to the correct height. The underside must be horizontal and at the same height as support part Mark 4. Fit both support parts Mark 7a on both sides of support part Mark 7b and prop up until they are horizontal. All of this is adjusted using support Mark 11. Support part Mark 8a and 8b can now be fitted and propped up. Using support Mark 12 the support part is moved into the correct position. Support part Mark 13 (14) is secured to support part Mark 8a (8b), into which support Mark 13 is placed.

Place gang boards 13, 1 to 6 and 16 on the back row of supports. The platform steps are placed on top of 13 and 16, and on top of them gang boards 14 and 17. Gang boards 18, 12 to 7 and 15 are then fitted.

Place support legs underneath the platform.

Lay out beams Mark 6-8, fit them together, and fit struts Mark 9 and 10 to support parts Mark 7a or 7b. Prop up the beams so that struts Mark 9 are lying horizontally. Raise frames 1-5 and suspend the end parts Mark 21-29 in between them. The gang boards can now be slid in between them or placed on top of them. These are secured using bolts.
Suspend the front row of platforms no's. 31-34, 36 to Mark 6-8 and prop up on the front. Now the steps Mark 35 can be fitted. Place the operator's panel in the desired position and fit the gates, which are to be fixed into position using the appropriate bolts.
Prop up the entire platform in accordance with drawing 115-05-384. All pins must be locked using sprung locking pins.
A safe system of work for access to the maintenance platform at the pivot point of the main arm and to the wire rope used for rescue purposes should be devised.

2.3 Electrical connection

The electrical supply is 400 V 3 Phase, neutral and ground, 130 kW. If the light package is included the electrical supply increases with approx. 30 kW. The connection to the public mains may only be carried out by authorised persons.

After connection the ground switch, it should be checked first on short circuiting and correct operation.

Check that the operating position is receiving power.

Check the direction of rotation of the machine. The direction of rotation is indicated. If the direction of rotation is incorrect, then the electrician will need to change the wires around.

The incoming electrical supply switch should be labelled, and hazard labels/authorised person labels should be attached to the electrical cubicles.

3 Operation

3.1 The ride objectives

The gondolas of the Topscan can accommodate 30 passengers. Access to the gondola is provided by the entry gate.

After the passengers are seated, the mast is raised and the ride starts. The variable hydraulic drive enables the main arm with the gondolas to go round in an oval circle, to the left and to the right. The gondola cross rotates to the left or to the right and is driven hydraulically. The gondolas are allowed to move freely using centrifugal force.
At the end of the program the gondola will stop at the same position as where it started.

3.2 Before embarkation

The ride is operated by at least two persons. Both help and check on the embarkation and disembarkation of the passengers. The person at the entry side is also the main operator and stays in the control cabin during the ride and is required to be attentive to the entire ride.

Before the first passengers of the day can begin their ride, the operator has to provide (or let others carry out) daily maintenance. Additionally, the operator has to check that the maintenance has been carried out as required. The operator is responsible for the safety of the passengers.
The operator must check if the warning signs are in position, complete and can be clearly read.
The operator must sit solely in the operating cabin during the ride and may not be disturbed.

Both hydraulic units must be switched on. Start with the gondola unit. The gondola arm and gondola cross must be in the zero position. The ‘zero position arm’ and ‘brake system release’ lights on the operating panel must be on. If the mast is in the lowest position, the ‘pillar low’ light comes on and the gondolas can be embarked

A picture of the main control panel with the display can be found in appendix A2 figure 5. A malfunction has to be resolved with reference to the chapter “Trouble shooting”.

3.3 Embark

The Topscan is meant for passengers of at least 12 years age, taller than 1.40 meters (55 inch) and who are in good health. In case of artificial limbs the passenger needs to have natural upper legs including the knees. Passengers with spinal complaints, high blood pressure, heart problems, pregnant women and persons under the influence of alcohol, drugs, medication or other narcotics are not permitted in the Topscan. Before the passengers take a seat they have to remove any loose objects. Bags, scarves and other loose objects may not be taken into the gondola. The attendants must check for this and there must be warning signs to this effect placed near the ride.

The passengers seat themselves and have to sit straight. The passenger has to place each leg on either side of the pommel. Next, the attendant closes the restraints by turning switches 4 to 1 on the gondola panel in that order (See appendix A2 Figure 8).

Switch 4 is operated and causes the pneumatic cylinders to be de-aerated. The restraints close slowly on account of their own weight, so the passengers have time to set their upper bodies properly in the seat.

If during closing of the restraints a passenger bends over, it is possible that the restraint will not close properly. If so, the operator has to turn *switch 4* back. The restraints open again. When all passengers are sitting straight, *switch 4* can be operated for the second time, and the restraints close again.

By turning *switch 3*, the hydraulic locking device is activated. Do not operate *switch 3* directly after *switch 4*, but wait until the restraints are almost closed. If during the lowering of the restraints *switch 3* is operated, the restraints will close more quickly and the passengers have less time to set themselves in the seat.
The passenger now places his/her arms and hands around the restraint so the restraint has good proper contact with the body. The passenger grasps the handgrips of the restraint.
After *switch 3* is operated, the light “hydr. lock” will light.

Now *switch 2 and 1* are to be operated to activate the mechanical locking mechanism. If all restraints are properly closed, for each seat a LED lights (6x5 total).
After all LEDs are lit, the control light “mech-lock” will also light.

If both the “hydr. lock” and the “mech. lock” lights on the gondola panel are lit, also the light “safety bar locked” on the main control panel in the control cabin will light.

The attendants should confirm at this stage that all restraints are firmly against the passenger, and are locked by pushing and pulling the restraint outwards, in which case the restraint should not move.

If one or more LEDs not light, it is possible that one or more restraints are not properly locked. The operator(s) first check the LEDs to see which restraint is not properly locked and then checks if <u>all</u> passengers are properly restrained, by performing the following steps (see Appendix A2 figure 1):

- Has the passenger placed the restraint firmly against the body (the attendant checks by pushing the restraint towards the passenger)
- Are the restraints hydr. and mech. locked (the attendant checks by pulling the restraint towards him/her)

The operators now check if all LEDs and control lights on the control panel are lighted. Only if the restraints are manually checked <u>and</u> the control lights are lit, all the passengers are properly secured.

If again one of the LEDs or one of the control lights is not lit, carry out a test. Push the button “light test” at the control panel and check if all lights are lit. If they are, then consult the chapter “trouble shooting”. If they are not, replace the broken light / LED. (do not start the ride with broken lights!)

If all LEDs and lights are lit, the operator’s steps down the platform and both operators check once again that:

- The control lights on the gondola are still lighting
- There are no loose objects and suchlike on the gondola
- Everything is safe and secure
- The passengers sit properly with the back against the seat.
- The passengers have a leg at either side of the node

Passengers should be spread between gondolas as evenly as possible

3.4 The ride

The operator starts the ride from the main control panel.

Press the button ‘start pillar up’ - the mast will rise up. Once the mast has reached its highest position, the ‘pillar high’ light will light up. The ‘pillar locked’ light should automatically light up. Now the ‘Release brake system’ button can be operated. The brake button does not need to be operated, if it is set to ‘release brake system’, and semi-automatic operation is being used. The arm as well as the gondola hub can now be rotated by turning the ‘arm rotation’ and / or the “gondola rotation” knob to the left or right.

For teach in and replay programs as well as further information of the operation of the ride, follow the instructions of the operating manual of Beenen Electrotechniek b.v. (see appendix E)

3.4.1 Ending of the ride.

The joystick for the gondola must be turned to 0. The arm is brought to the zero position using the joystick for the arm. The brake can be operated when the ‘zero position arm’ light is lit.
By pressing the ‘start pillar down’ button, the mast moves to its low position. The ‘pillar low’ light should come on. The ride also can be stopped with an automatic program.

When the ride frequency drops below one ride a 30 minutes, the hydraulic unit group 2 must be turned off. There is no cooling when the machine stands still.

3.5 Disembark

Both operators walk onto the platform and operate the switches on the control panel on the gondolas sequentially from 1 to 4. After having turned switch 4, the restraints will open.
Only after all passengers have left the gondolas, have taken their belongings, (if put on the platform) have left the platform the next (30) passengers can enter the ride.

The whole procedure as described in paragraph 4.3 until this paragraph will repeat again.

3.6 Emergency stop

If a perilous situation occurs for passengers, public or the Topscan during the ride, the button “emergency stop” should be pressed and the Topscan will stop as fast as possible.
The emergency stop command can be given from the control cabin by the main operator. (located on main control panel) When the ride has come to rest, first the emergency situation has to be resolved. The Topscan can be started again after the emergency stop has been reset:
To reset, turn the emergency stop button on which it “jumps out” and the reset failure button.
The Topscan also carries out internal checks. If a malfunction appears, the Topscan performs an (emergency)stop by itself.

3.7 Conclusion (close down)

At the end of the day, the Topscan has to be left in a safe and secure position. The Topscan has to be set to the 0-position. The operators have to close all restraints and the entry / exit gate have to be closed. The main operator has to turn of both aggregates. Take out the key switch from the control panel. The operating cabin needs to be closed and locked. Turn off the main switches and close and lock all cabins.

4 Trouble shooting

4.1 Power failure

In the event of power failure or drive failure, it must be ensured that the passengers are able to leave the gondolas without any danger to them. The following procedures are to be carried out.
Valves named in paragraph 5.1.1, 5.1.2 and 5.1.3 are named in appendix A1 drg. 115-05-246 or 247 and their location is shown in appendix A2 figure 2

4.1.1 The main power supply fails, but there is still power from another power supply available.

An alternative power supply must be available, so the gondolas can be brought back to the embarkation position with the hydraulic emergency aggregate. (Appendix A2 fig. 9)

- Connect the aggregate to the alternative power supply.
- Close valves 1, 2, and 7. Open valves 3, 4 and 5.
- Start up the aggregate.
- Use the valve on the aggregate to bring the arm and the gondolas to the 0-position.
- Once the gondolas are at the 0-position, connect the manual pump to the main lift cylinders. (appendix A2 fig. 10) and close valve 9
- Pressure up till the gondolas and arm starts to lower. When the gondolas are in there low embarkation position, release the pressure. The gondolas stop lowering.

For the disembarking of the passengers the restraints can be opened using the emergency batteries.

- Connect the emergency cable between the emergency batteries and the gondola.
- To disembark, follow the regular procedure.

After the passengers have disembarked from the gondolas, turn off the emergency aggregate, set the valves 1, 2, 7, 3, 4, 5, 7 and 9 back to there original position and restore the main power supply.

4.1.2 All power supplies fail, more than 15 passengers seated.

If no power is available and there are more than 15 passengers seated in the gondolas, the gondolas rotate to their 0-position automatic by their own weight after the brake is released.
Follow the next steps to disembark the passengers.

- Turn off the main switches
- Open valve 6, Close valve 7
- Connect the manual pump to the brake release connection shown in appendix A2 fig. 12
- Pressure up the brake till it is released. The gondolas will now move to there 0-position.
- Once the gondolas are (almost) at the 0-position, connect the manual pump to the main lift cylinders. (appendix A2 fig. 10) and close valve 9
- Pressure up till the gondolas and arm starts to lower. When the lowest gondola is almost at the platform, release the pressure. The gondolas stop lowering.

When the gondolas are not exactly at the 0-position, the brake of the gondola cross is released to bring one gondola to the lowest point.

- Connect the manual pump to the gondola cross brake. (appendix A2 fig. 11)

- Close valve 11 and open valve 12
- Pressure up the brake till it is released. The heaviest gondola will now move to the lowest point.
- Set the brake of the main drive back by lowering the pressure.
- Disembark the passengers.
- Release the brake. The heaviest gondola will now move to the lowest point.
- Etc.

For the disembarking of the passengers the restraints can be opened using the emergency batteries.

- Connect the emergency cable between the emergency batteries and the gondola.
- To disembark, follow the regular procedure.
-

After the passengers have disembarked from the gondolas, set the valves 6, 7, 11 and 12 back to there original position and restore the main power supply.

4.2 Fault signals

On the main control panel an error light is integrated. If a malfunction occurs, the error light starts to light.

4.3 General malfunctions

Malfunction	Possible cause	Possible solution
1. The Topscan won't start	Power failure	Check the main fuse. Reset where necessary. Check main power supply.
	Not al start conditions are met	Check for malfunctions Check if the entry/exit gates are closed Check if al restraints are closed properly Check if the mast is "high" and locked
2. The Topscan has stopped during a ride sequence	Power failure during ride	See 5.3.1 Bring down the gondolas as described in 5.1 and disembark the passengers.
	There is an malfunction see the display	Solve the cause of the malfunction, reset and start again. (if it takes a while, first disembark the passengers)
	The main gearbox or motor has seized up	Evacuate the passengers with a mobile crane.

4.4 Malfunctions regarding restraints

Malfunction	Possible cause	Possible solution
1. All the lights / LEDs on the gondola won't extinguish on restraints open	There is a short circuit in the system	Check the entire electric system and remove the short circuit
2. One LED remains lit on control panel, when all restraints are open	A proximity switch is not set correctly	Close the restraints and open the back cover of the respective seat. Set the distance between proximity switch and the indicator between 2 and 3 mm. Open the restraints and check if the LED is off. Close the back cover.
	A proximity switch is broken	Open the back cover of the respective seat, and check the proximity switch and replace if necessary. Close the back cover.
	There is a short circuit In the system	Check the entire electrical system and remove the short circuit
3. All restraints of the gondolas won't open. (Without passengers)	Power failure	Check the control voltage and resolve Check that the hydraulic locking valves are powered-up and bring to an operating state where necessary
	There is no air	Check the compressors and resolve
4. All restraints of the gondolas won't open (With passengers)	Power failure	Inform the passengers of the problem. Connect the emergency power cable Open the restraints of the gondola normally with the buttons 1 through 4. Resolve the power failure and turn back the emergency power switch.
	There is no air	Inform the passengers of the problem. Check that there is air in the tanks through tapping-off water. If there is no air in the tanks, there's a hose leaking or the compressors are not working. Repair the air supply.
5. One restraint won't open	The mechanical locking mechanism won't free	Open the back cover and release the mechanical locking mechanism. Repair the mechanical locking mechanism. Close the back cover.
	The hydraulic locking mechanism won't release	Open the back cover and check that the valve is working. Replace if necessary
	The restraint is bent	Check and replace where necessary

Malfunction	Possible cause	Possible solution
6. The restraints of the gondola won't open simultaneously	The pressure in the accumulator is too high allowing the restraint to move too quickly	Open all restraints and remove the back cover of the malfunctioning restraints. Check the hydraulic system and resolve. Connect the black hose to the undermost connection and measure the pressure, see 5.5. Decrease the pressure to 16 bar by tapping-off some oil. Remove the handpump and check if problem has been resolved. Reassemble the back cover.
	The pressure is too low in the accumulator allowing the restraint to move erratically	Open all restraints and remove the back cover of the respective restraint. Check the hydraulic system for leaks and repair.
	An accumulator has seized.	Open all restraints and remove the back cover of the respective restraint. Take the handpump and connect the black hose to the undermost connection. Remove the pressure from the accumulator. Replace the accumulator. Bleed off the hydraulic system (see above). Check the entire locking system again. Reassemble the back cover.
7. A restraint opens too far during testing of the hydraulic locking mechanism	A hydraulic cylinder is leaking	Open all restraints and remove the back cover of the respective restraint. Take the handpump and connect the black hose to the undermost connection. . Release the pressure from the accumulator. Disassemble the hydraulic cylinder and replace. Bleed off the hydraulic system and check the entire locking mechanism again. Reassemble the back cover.
	An electric/hydraulic valve is leaking	Open all restraints and remove the back cover of the respective restraint. Take the handpump and connect the black hose to the undermost connection, see 5.5. Release the pressure from the accumulator. Disassemble the electric/hydraulic valve and replace. Bleed of the hydraulic system (see above) and check the entire locking mechanism anew. Reassemble the back cover.

Malfunction	Possible cause	Possible solution
8. One restraint won't close	The restraint is bent	Move the restraint back and forward and check that the restraint has sufficient tilting clearance in the bearings. Replace restraint if necessary
	The pneumatic cylinder won't move	Close the restraints. Disassemble the back cover from the respective restraint. Check that the cylinder is straight and replace if necessary. Check that the air pressure of the cylinder is off through turning the coupling somewhat. Where necessary clean the tubes and fast relief valve. Loosen the cylinder and check that this moves flexibly. Replace the cylinder where necessary. Reassemble the back cover.
	The hydraulic cylinder won't move	Disassemble the back cover of the respective restraint. Check that the hydraulic cylinder is straight and replace if necessary. Connect the handpump to the accumulator. The black hose must be connected to the undermost connection. Check the pressure in the accumulator and bring this where necessary up to operating pressure. Try out the restraint several times and see if the problem has been resolved. The hydraulic cylinder may have to be replaced, allow the accumulator to empty to the handpump and loosen the hydraulic cylinder. Try manually to move the cylinder. If the cylinder runs too heavy, then it has to be replaced. The hydraulic system has to be bled off, see above. Try and see that the restraint now works properly and reassemble the back cover.
9. One restraint won't allow operation	The restraint does not close sufficiently	Try to close the restraint. Open the restraints where necessary and re-close listen for at least 1 click on closing
	There is no release to operate from the locking mechanism	Disassemble the back cover of the respective restraint. Check if the proximity switches give a signal. Fine-tune the proximity switches to 2-3 mm margin Measure the electric cables and check that they are ok, replace if necessary

4.5 Procedure de-aeration of the hydraulic locking system

If a shoulder restraint doesn't close quickly enough, the hydraulic cylinders have to be refilled with hydraulic oil (Shell Tellus 22T).
The pretension (if the restraints are closed) is at least 8 bar. The maximum pressure is 10 bar.

De-aeration of the hydraulic locking system (see Appendix A2 figure 14):

Preparation:
- The restraints need to be open, enforce switch 4 & 3
- Check the oil level in the handpump (Shell Tellus 22T)

Connect the handpump as described hereafter:

- The valve on the handpump needs to be closed
- Connect the transparent hose to the top connection point
- Connect the black hose to the bottom connection point
- Easy pump with the handpump until all air has been removed from the system
- Disassemble the transparent hose
- Open and close the restraints a few times
- Reconnect the transparent hose until all air has been removed
- Disassemble the transparent hose
- On OPEN restraint pump slowly until ca. 16 bar (with accumulator of 4 bar)
- Check again by opening en closing the restraints a few times

The restraint closes too slow	→	Pressure too low, increase
The restraint closes too fast	→	Pressure too high, decrease
The restraint closes equally to the others	→	Everything o.k.
The restraint opens partially or not at all	→	The accumulator is broken or is low on pressure

5 Inspection and Maintenance

The whole ride consists of several main parts, which all contain important items which need to be checked on correct functioning, appearance and need to be lubricated on a regular basis.
It's strongly advised to follow up all maintenance and inspection checks as described in this chapter. The requirements are divided in several time spans: daily, weekly, monthly etc.
Please note that the daily maintenance should be carried out always!

5.1 Starting up after erecting or at start of season

- Check if the ride is correctly assembled.
- Check if the flange connections are still properly tightened and if all pin connections are correctly assembled and secured against disconnection.
- Check if the signs with directions have been placed.
- Check if the supports are still in there proper position.
- Check if the persons that will be operating the ride are aware of the instructions and safety measures.
- Carry out the daily maintenance.
- Check the emergency aggregates oil level and filter pollution. Clean or change filter when the indicator turns red.
- Test and practice the emergency passenger's evacuation as described in par. 5.1

5.2 Daily maintenance

Switch off (disconnect) the Topscan. In the operator cabin, turn off the main power. Ensure that the Topscan can not be operated or become operational during maintenance!

5.2.1 Visual inspection embarkation / disembarkation

- The fencing (gates)
- The stairs
- The platforms
- Warning signs
- Oil leaks at the cylinders, hoses and the hydraulic unit.
- Improper occurrences.

5.2.2 Visual inspection masts

- Cracks in the steel structure
- Improper occurrences.

5.2.3 Visual inspection drive heads

- Motor and brake
- Gearbox (incl. Reaction arm and coupling)
- Slewing ring
- Electric slip rings
- Oil leakage
- Cracks in the steel structure
- Improper occurrences.

5.2.4 Visual inspection gondola

- Bent (seat) restraints
- Broken seats
- Compressor
- Oil leakage
- Cracks in the gondola and supports
- Leaking air hoses
- Closed back covers.
- Improper occurrences

5.2.5 General inspections

- Inspect all assembly connections to ensure that they are in the correct position and that they are locked to prevent coming loose. (see appendix D for torque list)
  Inspect the hydraulic aggregates oil level and filter pollution. Clean or change filter when the indicator turns red.
- Check the main brake.
  The gondola arm must be in the boarding position. When pushing the gondola hub with two persons the arm may not move.
- Check the loading of the emergency battery.

5.2.6 Inspection of the body of the Topscan

- The welds in the curved area of the main gondola arm (item 2 drawing number 115-05-092).
- The plates connecting the two hydraulic cylinders to the head of the mast and the associated welds (item 5 drawing number 115-05-092).
- The welds at the points where the two main front support arms are connected to the wheeled chassis (item 10 drawing number 115-05-092).
- The welds at the points where the transverse chassis beam is connected to the main support arms (item 1 drawing number 115-05-092).
- The welds on the flanges of the gondola cross (item 12 drawing number 115-05-092).
- The welds in the curved area of the gondolas between the slew ring and the innermost seat and the welds at the flange connecting the gondola to the slew ring at the distance piece (item 1 drawing number 115-05-007).
- The welds at all flanges and ribs connecting the main gondola arm and the counterweight arm to the main hub (items 2, 3 and 4 drawing number 115-05-092).
- The welds on the corner plates at the top of the seat frames (drawing number 115-05-007).
- All passenger restraint bars in the curved area of the tube adjacent to the pivot points at the seat frames (item 1 drawing number 115-05-048).

If cracks have been found in the Topscan, the Topscan may not operate further. Immediately contact:

Mondial fair attractions Holland b.v.
Aengwirderweg 57
8449 BA Terband-Heerenveen
Holland
Tel. +31 (0)513610170
Fax. +31 (0)513622412

5.2.7 Inspection gondola - restraints

- Turn on the main switch and the on / off switch in the control cabin. Check the lights on the main control panel by means of the light test button and thereafter check also the lights on the gondola control panels by pressing the light test buttons. Replace broken lights.

- Open all restraints with the buttons 4 to 1 on the gondola control panel.
  Check if all restraints open approximately equally. If one restraint opens to slow, the related cylinder needs to be de-aerated.

- All lights and LEDs on the gondola should extinguish. If not, solve the problem by means of the trouble shooting chart.

- Close the restraints by operating switches 1 to 4, one person should prevent the closing of one of the restraints by holding it, then lower the restraint slowly. During closing 8 clicks (per restraint) have to be heard. At the first click of every restraint its LED lights to indicate that the restraint is locked. The LED has to remain lighting the remaining clicks. When a LED lights only at the second click or even later, probably a tooth of the related mechanical locking device sticks. When the LED doesn't light at all, check the proximity switch, repeat this procedure for all the chairs.

- The restraints are open. Close and push all restraints . Now operate switch 4, 2 and 1. The restraints now have to remain hydraulically locked. Check after three minutes if the restraints have gained more than three centimeters clearance (gone up). If so, the hydraulic system of that restraint has to be de-aerated with a special hand pump. If this doesn't solve the problem, the accumulator, cylinder or control valve has to be replaced.

- Tap off the water from the air pressure tanks at the bottom of the gondola by opening the valves at the tanks until no further water is released. See appendix A2 figure 15

5.2.8 Greasing of the slewing rings

Grease the slewing rings. The main ring, gondola cross ring and gondola ring has to be greased with a grease gun, the grease nipples are assembled around the ring (see appendix A3 for used lubricants). Check if all bolts of the slewing rings are properly fastened.

5.2.9 Inspection running of ride

- Close all restraints by operating switches 4 to 1 on the gondola panels.
- Make a ride sequence with the Topscan and check all possible movements.
- Observe the ride carefully. Pay attention to improper occurrences.

- Check the emergency stop at slow speed.
  Press the button “Emergency stop” at slow speed. The Topscan now stops as soon as possible. Bring the arm in the zero position and “Start pillar down” to bring the gondola to the embarking position. Reset the emergency stop by rotating the button until it “jumps” out. Thereafter reset the program by pressing the “reset failure” button.

5.3 Weekly maintenance

Switch off (disconnect) the Topscan. In the operator cabin, turn off the main power. Ensure that the Topscan can not be operated or become operational during maintenance!

- All parts of the locking system of the passengers (restraints, hydraulic and mechanical locking) and the frames of the seats need to be checked on correct functioning. Therefore the back covers have to be disassembled. Note that the restraints need to be closed. Pass through the following points.

  Check if every restraint is locked to the last tooth. If needed adjust with the pneumatic cylinder.

  Measure the clearance between the proximity switch and the signaling strip. The clearance between them has to be a minimum of 2 mm, adjust if necessary this clearance between 2 and 3 mm.

  Check for leakage in the hydraulics and listen for pneumatic leaks.

  Grease lightly the hinge point of the locking bars (at top) with oil. (See Appendix A3).

  Reassemble the back covers.

- Check the oil level in the gearboxes.

- Check the roller switches at the top lift cylinders. Check manually if they move easy. A click can be heard at the moment they connect.

5.4 The first week after starting up and the first post winter week

The tightness of all bolts must be checked, including those for the compressors, tanks, covers and fence, etc. (see torque list in appendix D)

5.5 Monthly maintenance

Switch off (disconnect) the Topscan. In the operator cabin, turn off the main power. Ensure that the Topscan can not be operated or become operational during maintenance!

Measure the thickness of the brush holders on the slipring at the drive head and at the gondola arm. Replace the collectors if the brushes are worn down to 1mm. See also the FABA manual at appendix E

Check the oil in the gearboxes of the drives: Used oil Mobil Gear SHC 220. First oil change after ca. 200 working hours. Then change oil every 400 working hours or three times a year, whichever comes first.

The tightness of all critical bolts must be checked. (see appendix D for torque list)

5.5.1 Changing the oil in the main drive gearbox.

Turn the arm to the left until the drain plug of the gearbox is in the most left position. Remove the mechanical lift cylinder limiter.
Lower the mast till the gearbox of the main drive is in horizontal position. (See appendix A2 fig. 18.)
Switch off the main power of the machine. (Make sure the Topscan can not become operational during maintenance)
Mount a hose with a 3/8” connection to the drain valve on the bottom side of the main mast. (See appendix A2 fig. 16)
Disconnect the hose, which is mounted between the upper (de-aeration) plug of the main drive gearbox and the accumulator, from the plug.
Open the drain valve. The oil runs out of the gearbox.
Make sure the oil also runs out of the cooling unit and other parts off the system.
Fill the gearbox with new oil via the hose at the drain valve with a manual pump.
As soon as oil comes out of the de-aeration plug, there is enough oil in the gearbox. If the oil is rather cold, it needs more time to fill the unit well so that the oil is in all parts of the gearbox without bubbles. Close the drain valve and remove the 3/8 hose. Remount the hose between the gearbox and the accumulator.

5.5.2 Changing the oil in the gondola drive gearbox.

Remove the fences and some platforms as shown in appendix A2 fig. 18
Turn the gondola cross till one drain valve of the gondola drive gearbox is in the right most position. (Appendix A2 fig. 17)
Turn the arm in horizontal position.
Remove the mechanical lift cylinder limiter.
Lower the mast till the gearbox of the gondola drive is in horizontal position. (See appendix A2 fig. 18.) One drain valve is now at the bottom side of the gondola.
Open both valves and let the oil run out.
Fill up the gearbox with new oil by using the manual pump. The amount off refill oil is the same as the amount of drained oil. (approx. 8 litre)
Close both valves.

5.5.3 Test the pressure switches on the gondola, see appendix A2 figure 19.

Disconnect the quick coupling at the hub of the main air supply to one of the six gondolas and connect in line the pressure reducer kit.
Open the electrical box on the gondola. Inside are two leds. The main electrical switch and the key switch on the control panel must be on.
Bleed the air behind the pressure reducer by switching the air switches 1 and 2 on the operating panel of the gondola. Thereafter, set both switches to be switched position.
Open the pressure reducer slowly. The pressure in the system will increase, as can be seen on the manometer. At a pressure of 1 bar (plus or minus 0,1 bar) the pressure switches must close the circuit and the two leds will light up. If the leds doesn't light up, the pressure switch or both switches needs adjustment or replacement.

Repeat the test for the other pressure switches on all the gondolas.

Afterwards disconnect the pressure reducer kit and replace the hose of the gondola to the hub. And close the electrical box on the gondola.

5.6 Yearly maintenance

- Check or replace the emergency battery (24V)

- Take oil samples of the hydraulic oil from the hydraulic units, and let a laboratory make a prognosis when the oil has to be changed.
  - Hydraulic unit of the main drive:
    Capacity approximately 600 litres of SHELL Tellus T46. Also see instructions from Mannesmann Rexroth.
  - Hydraulic unit of gondola drive:
    Capacity approximately 100 litres of SHELL Tellus T46. Also see instructions from Mannesmann Rexroth

- Clean the slip rings of the main drive and the gondola drive.

- The compressor is oil free. Replace or clean the air filter once a year.

- Manually grease the main pivot (hinge) point of the mast and the top and bottom eye of the lifting cylinder. (Used grease Esso Beacon 2)

The entire Topscan has to be inspected by a specialist from Mondial fair attractions Holland b.v.

5.7 Preparing for winter / at the end of a season

- Carry out the yearly maintenance.
- Grease the slewing rings, see daily maintenance.
- Close the restraints. Remove the back covers and grease the rods of the pneumatic, hydraulic and mechanical locking mechanism with oil, (See appendix A3). This to prevent corrosion during the winter time. Reassemble the back cover afterwards.
- Drain-off water from all the air-tanks.
- Check the Topscan for damage and repaint during winter.
- Grease all corrosion sensitive surfaces such as cylinder rods and shafts with oil.

6 Disposal

When the Topscan is discarded, this has to occur in accordance with the laws and regulations in force at that time. The Topscan has to be safely dismantled in order to preserve both humankind and the environment.
Minimally, the following requirements have to be met:

- The power has to be disconnected
- The batteries have to be disassembled and removed
- The oil has to be drained off and removed

For further safe disassembly, the power local valid laws and regulations have to be followed. If the Topscan is again erected at another place, then both the disassembly and assembly has to be carried out under supervision of Mondial fair attractions Holland. b.v. If disassembly does not take place under the supervision of Mondial fair attractions Holland b.v. , the ride must be scrapped!

7 Technical specifications

Supplier:	Mondial Aengwirderweg 57 8449 BA Terband – Heerenveen Holland Tel. +31 (0)513610170 Fax +31 (0)513622412 e-mail. info@mondialrides.com	
Capacity	30 persons (6 gondolas of 5 persons)	
Power supply:	400 V / 3ph / 50 Hz Main drive Illumination	 130 kW 5 kW (standard package)
Main dimensions:	Width: Depth: Height:	16.8 m 19.14 19.3 m
Total Weight:		82 ton
Speed:	Max. speed main drive: Max. speed gondola:	8.3 RPM 10 RPM
G-force passenger:	Max.	4 g
Passengers:	min. aged 12 years, min. 1.40 m (55 inch) tall.	