BoomVane
-PATENTED-
- MANUAL -

version 7

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The **BoomVane** is a flow-powered device for both shore- and vessel based oil boom deployment.

In rivers and canals this powerful, yet light spill response tool allows for rapid boom deployment, spill control and recovery without the use of boats, anchors or fixed installations. The system can be operated in waters with heavy traffic as the **BoomVane** (and boom) is easily retrieved to shore and re-launched again without de-mooring.

The **BoomVane** is also ideal for advancing systems / vessel sweep operations, allowing for very wide, single vessel sweeps, with a wide range of system configurations.

The **BoomVane** is constructed as a cascade of vertical wings mounted in a rectangular wings frame.

The wing cascade is kept at an optimal angle to the water flow by a control rudder mounted between folding arms. The rudder, turned by a separate control line, allows for retrieval of the **BoomVane** to the launching point. Above the rudder, a stabilizer wing is mounted, maintaining the vertical inclination of the wing cascade. A float is bolted to the top of the wing cascade.

Powered by the current flow the **BoomVane** - held only by a single mooring / tow line - swings out and away from the operator with the oil boom in tow. The **BoomVane** is completely stable and self-trimming in water speeds ranging from 0.5-5 knots, insensitive to ‘chop’ and fluctuations of the flow. Professional users have successfully deployed the **BoomVane** in even faster waters.

### 2 - Safety caution and liability

**Working with the BoomVane** and related equipment can be dangerous and may result in injury or death. Proper training, appropriate equipment, adequate safety measures and a common sense approach are essential.

A safety area around the deployment site should be established, and only trained personnel should work with the **BoomVane** and related equipment. Extreme caution should be exercised when approaching and handling lines.

**ORC AB does not assume any liability for damage to property or injury to persons or death arising from the use of the BoomVane**, any such liability is expressly disclaimed. As stipulated in ORC’s **General Conditions of Sale**, any legal action in this context shall be taken under the laws of Sweden.
3 - River system configuration

Deflection and recovery mode

The *BoomVane* is a versatile spill control tool - perfect for both recovery and deflection modes of operation. As shown in the sketch below, deflection serves two primary purposes: (1) deflection / exclusion booming to protect resources such as water intakes, beaches or other environmentally sensitive areas; (2) deflecting oil [from mainstream] to a shore-side recovery point.

Moored by only one line the *BoomVane* is completely self-trimming and requires no attendance once deployed. The *BoomVane* may be used with any type or make of oil boom or skimming system, although shallow draught booms with low drag are recommended.

Cascade mode

To gain extended coverage (system width) of the river, multiple *BoomVanes* can be deployed in cascade formation.

Wind barrier mode

For waters where oil is moving downstream with the [typical] mid-channel current, but wind drives oil onto the lee shore, the *BoomVane* can be used to deploy a very long shallow draught river boom (>1000 m) with the downstream end of the boom trailing free in the water.

As the influence on the boom from the current is much greater than that of the wind, the boom will maintain a barrier against the wind-driven oil along a sensitive shore up to a point where effective recovery is feasible.
4 - River boom deployment procedure

1. Determine the system launching point, taking into consideration practicable upstream (mooring line) and downstream (boom) mooring points. Assemble and rig the BoomVane (ref section 6 & 7). Lay out the entire system along the bank - the mooring line taut but some slack on the boom. Set up the mooring points for the up- and downstream ends of the system - as close to the water as possible. Trees are ideal, but for ‘barren’ banks without large rocks some artificial anchoring system, e.g. a series of earth nails, may be necessary (light vehicles are NOT recommended as anchors). Connect the BoomVane, mooring line and boom to the connector plate.

2. Push the BoomVane from the bank and let it float free. Ensure that the stabilizer arms point downstream and the control rudder is swung back to the ‘out-going’ position when the current ‘caches’ the vanes. The BoomVane will swing towards midstream with the boom in tow. Have the control line manned - not taught, just enough to take up the slack.

See part 7 - Hints on handling for further advice on system launching.

3. When the BoomVane has towed out and positioned the boom, the mooring line length and/or either of the mooring points may need to be adjusted/moved to achieve optimum boom-to-current angle.

As a safety precaution, always take the BoomVane back to shore by operating the control rudder (see 4. below), thus taking the load off the mooring line, before attempting to adjust the mooring line length. This rule applies to both paying out and taking in line.

4. The BoomVane control rudder (operated by the control line to shore) stalls the main wing cascade and brings the system back to the shore. This operation is both for system adjustment and recovery, as well as for letting vessels pass.

Personnel entering the water to launch the BoomVane should wear a safety harness with a manned lifeline to shore. The control rudder line should also be manned on shore when personnel is in the water. When wearing waders extra caution should be taken to avoid filling these with water. Always be aware of tripping hazards!
1. As in the previous example, determine the system launching point, assemble and rig the BoomVane (ref section 6 & 7). Lay out the mooring line only - as taut as possible. Connect the BoomVane, the mooring line, and the upstream end of the boom (using a short line) to the connector plate - the bulk of the boom still in its rack/pallet/trailer on shore. Set up the mooring points for the up- and downstream ends of the system - as close to the water as possible. Connect the BoomVane, mooring line and boom to the connector plate.

2. Push the BoomVane from the bank and let it float free. Ensure that the stabilizer arms point downstream and the control rudder is swung back to the ‘out-going’ position - a boat hook may be required to set the BoomVane in the correct orientation. The BoomVane will swing towards midstream, with the boom in tow.

3. Once the entire length of boom is out, bring back the BoomVane to shore by tripping the control rudder. Giving it a little time, the current will push in the downstream end of the boom to within reach of the shore*.

4. Recover the downstream end of the boom and moor it to shore, selecting a mooring point and/or paying out line so as to provide the slack required for BoomVane to ‘reach’ the desired position in the river. Re trimming - see (3) in the previous example.

The advantage with this method is that the BoomVane does some of the hard work - unloading and laying out the boom. Also, for any given length of boom, the downstream end of the mooring point is more or less given without having to pace the length. Most important though, is that it allows for deployment of a boom where the shoreline is not accessible all the way between the launching point and the downstream mooring point.

*Note! Due to local variations in the strength and direction of the current, and shoreline formation, the downstream end of the boom may not drift all the way to within easy reach of the shore. As a precaution, always have a length of floating line with a buoy or fender at the end tied to the end of the boom, which can be caught with e.g. a small grapnel thrown from shore.
5 - Vessel sweep applications

The stability of the *BoomVane* in high speeds and choppy seas provides for a range of vessel applications in coastal and offshore waters. With long tow lines and shallow draught coastal booms, sweep widths of 100-150 meters are attainable. Apart from the obvious savings when only one towing vessel is required, the operator also avoids many of the practical problems inherent in two-vessel sweeps (ref. speed and distance coordination). As an example, with a *BoomVane* open “U” or “V” sweep, the boom opening is always centered as long as the vessel maintains a straight course. The elasticity of the system also saves boom wear and tear.

**BoomVane**

vessel sweep applications

*Double, trailing open apex U-sweep as fore-sweep to conventional sweep vessel with rigid outrigger arms*

*Double off-the-side sweep & recovery system for larger vessels*

*Single, trailing U-sweep offset for ‘close shave’ of shoreline or shallows*
5.1 - Vessel sweep system configuration

Off-the-side *BoomVane* vessel sweep

For the fast sweeps, the maximum sweep speed can be increased - at the cost of decreased sweep width - by shortening the tow line [thus running the boom more parallel in relation to the vessel]. By running a deep “J-” or “U-shaped” boom on the other hand, the sweep width is increased but maximum sweep is typically less than 1 knot as a result of the maximum angle boom-to-flow.

General note:
* vessel width, mooring arrangement and boom draft determines overall system geometry
* geometries in the sketch above are based on oil boom draft 0.5 m, lesser draft allows for longer boom and greater sweep width
* base line sweep width > effective sweep width
* all numbers approximate

The above sweep arrangements can of course be one-sided. However, with smaller, especially shallow draft vessels it might be difficult to make turns in the direction away from the sweep, and also to compensate for the off-set in the steered course resulting from the assymetrical forces to which the vessel is subjected.

The predominant variables determining the sweep system performance, e.g. sweep width and speed - is on one hand the oil boom draft (and to some extent the type), and on the other hand the distance between the bow and stern mooring points. This sketch illustrates how deck width and mooring arrangements, e.g. positioning of cleats etc., determines the overall system geometry.

The vessel depicted in this example has a disadvantageous geometry with its sleek hull and narrow bows. A modern work vessel on the other hand is typically wider and the deck more rectangular, which allows for a longer and less angled system baseline, and corresponding wider sweep width.

Regarding the oil boom draft, the geometry in this sketch corresponds roughly to a 0.5 m deep boom. Lesser draft (0.3 - 0.4 draft should be fine in sheltered waters) allows for longer boom and wider sweep.

Note also that the *BoomVane* tow lines should 'exit' the vessels side as close to the water as possible to minimize the vertical angle of the line, or both the boom end and the *BoomVane* may be 'lifted' out of the water when the sweep picks up speed.
Vessel trailing *BoomVane* sweeps

There are a number of alternative ways of configuring single vessel, trailing sweeps - single or double *BoomVanes*, open or closed end, with or without attached skimmer or treatment device.

Closed “U”-sweeps as well as open fore-sweeps are deployed well astern of the towing vessel to minimize propeller wash disturbing the oil concentrated in the sweep, and to improve system geometry (longer lines allow for wider sweep swath), which is one of the advantages over off-the-side sweeps. The disadvantage is that the angle direction of flow-to-boom at the bottom of the “U” (applicable for both open and closed systems) allows only for very low sweep speeds or oil is lost under the boom. There are ways to reduce this problem, all of which are based on inducing additional drag on the bottom of the “U”. Hooking up a skimmer vessel or a skimmer with boom connectors to the boom opening is one example. Attaching sea anchors to the opening is another:

In the case of an open trailing sweep, a line from the open boom opening to the following skimmer vessel - the latter being ‘dragged’ along - the “U” curvature of the boom can be straightened out to a “V” and thus allow for a higher sweep speed. If the skimmer vessel is large and creates excessive drag, it may ‘ease’ the load by going dead slow ahead.

“V”-curvature can also be achieved by connecting a drogue or sea anchor to the downstream opening in the boom. The drogue should be run at some depth, to reduce unwanted turbulence at the surface.

*Inducing downstream drag will of course affect the BoomVanes and result in a somewhat reduced sweep width - however, this is generally found to be acceptable in view of the increased sweep speed.*
5.2 - Vessel sweep deployment procedure

General hints on handling

**Mark the lines** - When operating *BoomVanes* off both quarters, mark the respective towing lines so that the two units can be run with equal distance from the vessel. This is especially important with open sweeps where the opening must be centred farthest down-stream of the sweep to be effective.

**Reel storage** - If the boom is stored on one large reel only, start by reeling on the two towing ends (parallely). This may require an extra hand or two during launching and recovery but is faster, and as the ‘bottom’ of the U will come on last, it facilitates switching boom configuration between open and closed U-sweeps without having to unreel the boom. Use also an even number of boom sections so that the opening will be in the middle of the U with equal length of the the two tow lines.

**Boon opening** - When deploying an open-ended sweep and using an oil boom un-tried in such deployment mode, study [close-up] the behaviour of the boom ends at the opening and be prepared to adjust the lengths of the upper or lower wires/ropes in relation to each other as this relationship controls whether the boom ends are inclined to dive or ‘plane’ up.

**Back eddies** - If the turbulence at the opening leads to oil spreading up-wards along the outside/back of the boom, some operators hook up a few meters of boom to each end at the opening, letting these sections trail free after the sweep to hinder such ‘back-eddies’ from forming.

**Control line & back-water flap** - If operating in ‘unobstructed’ waters where no narrow passages through which the sweep will not pass, run the *BoomVanes* without the control line – the less lines in the water the better.

**Crane lift** - If a crane is used to lift the *BoomVane* from the deck to the water it may be difficult to reach down to un-hook. Also, if the water is choppy, the *BoomVane* may bob in the water and the float damaged by hitting the hook/crane arm or smashing into the vessel side. Instead, with the *BoomVane* still on deck, make fast a handling line to the hook, run it through the *BoomVane* lifting eye and back through the hook to a handler on deck, who will hold back on the line while the *BoomVane* is lifted over the railing. With the *BoomVane* in the water, the line end can be dropped and the line retrieved from the hook.

**Small boat towing point** - A well placed towing point is essential - especially on small boats - to maintain vessel manoeuvrability. If there is no centrally placed towing post or hook, well forward of the rudder, it is recommended that a bridle with a running block, is rigged between the boat sides.

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*Extreme caution should be exercised when paying out line while under way. The crew member at engine control must be in continuous visual and/or audio contact with the crew member handling the tow line throughout this sequence.*
Off-the-side sweeps

Assemble the BoomVane on deck and connect the tow [mooring-] line to it. Run the line to the bow cleat through any chock or similar to improve the system geometry (see previous section ‘Off-the-side vessel sweep geometry’) and make fast with enough slack to permit lifting and launching of the BoomVane. Shackle the upstream towing end of the oil boom to the connector plate (if a line is used for the connection, minimize the length of it – especially if the vessel length is a limiting factor as regards the overall system size). If the boom towing-end has no float, (and also if the boom itself has low reserve buoyancy) it is recommended to add a float to the towing-end so that the boom end is not pulled under when running.

When and how the boom is put in the water, and the downstream end of the boom is to be hooked up depends on the skimmer used – this is rarely critical. The important steps that follow are:

1. The vessel may go slow ahead when the boom is launched but should be dead in the water when the BoomVane is lifted from the deck down into the water. See note on crane lift under ‘General hints on handling’ above.

2 - 3 Keep the BoomVane away from the ship’s side and off the boom with a boat hook or barge pole while taking in excess slack on the tow line. With the tow line shortened, make it fast again in a manner which will allow paying out line when under load. ‘Help’ the BoomVane to the correct orientation by ‘rotating’ the BoomVane so that the stabiliser arms point downstream, and go to dead slow ahead.

4-6 When the BoomVane swings away from the vessel with the boom in tow, slowly and with great care pay out on the tow line until the maximum allowed boom angle at the downstream end is reached. Make fast again and increase speed to full sweep speed.

If the J-curvature of the boom turns out to be too much, stop the vessel dead before attempting to shorten the tow line.
Trailing sweeps

As opposed to the ‘off-the-side’ sweeps, oil recovery is typically done by a vessel other than the one towing the boom sweep. If such a skimmer vessel is a dedicated oil response vessel – whereas the vessel towing the boom can be a true vessel-of-opportunity, and a very small one at that - it may be convenient to have the skimmer vessel carry the oil booms to the site of operations and do the actual launching of the booms. The two ends of the boom can then be passed to the tow vessel by heaving lines. Regardless of which vessel stores and launches the oil boom, and regardless off which trailing sweep systems is used – open, closed, single- or two-sided – the common procedure is to have the boom launched and in the water with the two towing ends temporarily made fast to the stern or sides of the tow vessel, before the BoomVanes are launched.

With the boom in the water, the procedure for launching the BoomVane(s) is similar to that of the off-the-side sweep discussed in the previous section. A major difference however, is the position of the tow line mooring point. In the case of the off-the-side sweep, said position is critical to the overall system geometry – that of course is not applicable for the trailing sweeps. For all trailing sweeps the tow line mooring point is chosen in view of vessel manoeuvrability [only]. Ideally, the vessel has a towing post or bollard with a ‘clean’ deck aft of it. If it does not a, a bridle should be considered. Regardless of how and where the tow lines are made fast, it must be a forward of the vessel rudder or turning may will be difficult if not impossible.

1. Assemble the BoomVane on the deck (for double BoomVane sweeps, assemble one unit at the time if work space is limited).

2. With the BoomVane on deck and made fast with a shortened line (a little slack only to allow lifting it into the water), take one end of the boom (temporarily made fast to the stern) and pull it up and make it fast to the BoomVane connector plate.

3. The [first] BoomVane can now be now be launched – see previous section ‘off-the-side sweep’ - and a single BoomVane sweep set and running. If only a single BoomVane is to be used the handling line of the end of the oil boom still hooked up to the stern, is lengthened and paid out along with the BoomVane tow line until the desired overall geometry is achieved.

4. If, on the other hand, it is to be a double BoomVane sweep, the procedure with the first BoomVane is repeated from the other side of the vessel. When lifting the second BoomVane into the water and hooking up the remaining end of the boom to it, the vessel needs to be more or less fully stopped.
Note that in comparison to the off-the-side sweep where it is recommended that the towing end is shackled directly to the connector plate in view of the over-all system geometry, this is not desirable for the trailing sweeps. To eliminate the risk of the boom end being pulled under when running, a short line (a few metres) can be fitted between the towing end and the connector plate - see last paragraph under 7 - Hints on handling. This short line also serves as a handling line to facilitate the aforementioned launching and temporary mooring of the oil boom.

Alternatively, as in the following example, the trailing sweep is launched by one [larger] vessel, but the towing will be performed by a different vessel - either an on-board work boat (as depicted below) or any vessel of opportunity.

The only differences as regards system handling, as compared to the previous example, are:

The oil boom and *BoomVanes* are launched separately from the deployment vessel (this is much easier and safer wear and tear, than lifting the *BoomVane* with the oil boom hooked up over the rail). The boom towing end line strops and the *BoomVane* towlines are retained on board, to be passed across to the tow vessel.

The vessel to tow the sweep takes over the boom towing end line strops and the *BoomVane* towlines are retained on board, when drawing up alongside the deployment vessel. The oil boom towing ends are then shackled to the *BoomVane* connector plates from the small boat - an easy task being closer to the water.
6 - Assembly

Preparation

No tools are required for assembly of the BoomVane.

Remove the BoomVane from the factory provided shipping/storage crate and place it on the ground with the two hinged arms facing up.

The two arms on top are the stabilizer arms and the curved plate that joins them at the end is the control rudder.

Initial Assembly

Remove the two locking bolts (with washers and safety clips) and retain them for re-insertion after the next stage of the procedure.

Gently swing the stabilizer arms upwards (ensuring the bridle shackles are not wedged) until the hinged ends are contained in the ‘sockets’ and the locking bolt holes on the main frame and the holes in the stabilizer arms are aligned. Replace the locking bolts removed during the previous step. Secure the locking bolts with the safety clips.

Orientation- color code

Before standing the BoomVane upright, note that it can be oriented in two ways: With the stabilizer arms in position as described above, stand the BoomVane up so that the stabilizer arms and control rudder point downstream (astern), and face the operator. To facilitate correct orientation, all components of later models are color coded red and green respectively - face the current (forward) and think of the BoomVane as a vessel with running lights, also heading upstream - it would show you green lights if it was on your port side, red light if it was on your starboard side.

Float Attachment

Retain the wing nuts and the two long float bolts for insertion during the Installation of Lifting Eye procedure below.

Place the red float on top of the main wing frame, with the widest part of the red float, the bulbous nose, being closest to the hinged section (this may require turning the float over) - if the BoomVane is color coded, match the colored stickers. Ensure that the positioning plugs on the float are fully inserted in the matching holes on the main wing frame.
**Attachment of Stabiliser Wing**

The rectangular stabilizer wing has three short metal extensions protruding from the base. The centered extension has a slot for the short square-neck bolt that fits the hole on the stabilizer arm (near the control rudder). The extensions protruding from the corners of the stabilizer wing fit the slot at the very end of the stabilizer arm.

Remove the bolt, washer and wing nut from the stabilizer arm. Place the flat base of the stabiliser wing on the top of the stabilizer arm above the point where the control rudder is attached. Note that the wing can be inserted two ways - the stabilizer wing must be oriented so that the wing is parallel to the main vane assembly (see color coding). Insert the metal extension fully into the metal slot at the end of the stabilizer arm. Secure with the bolt, washer and wing nut and hand tighten.

**Re-orientation / re-configuration when changing sides...**

To re-configure the BoomVane for use on the other side of the river or vessel, simply remove the lifting eye, float and stabilizer wing, turn the main wing frame upside down and reinstall the removed pieces on the ‘new up-side’.

**Control Rudder Return Springs**

The control rudder return springs ensure that the control rudder (after having been ‘activated’) always swing back to ‘drive’ position when the control line is released. The need for these springs is commented on under part 7- Hints on handling.

As of 2004, control rudder return springs are standard on all BoomVanes, but earlier models can easily be fitted with them as well.

If the spring holder plate ‘comes off’ when removing or inserting the stabilizer wing bolt, follow the instructions under 9- Maintenance.
Back-water Flap - see part 7 - Hints on Handling

Rigging

A very important feature of the rigging arrangement - contributing to the exceptional stability of the BoomVane system - is the connector plate arrangement. The boom is not suspended from the vane but connected directly to the mooring line. The BoomVane itself is hooked up to the connector plate by a single bridle only, thereby allowed to ‘fly free’ like a kite.

A typical river system comprises 5 lines:
1. The bridle that connects the BoomVane to the connector plate.
2. The 4 mm control rudder line.
3. The mooring line that anchors the entire system to a point upstream.
4. The boom strop that connects the oil boom to the connector plate.
5. The downstream boom line that anchors the end of the boom to shore.

Lines 1-3 are always supplied with the BoomVane. Lines 4-5 pertain to the oil boom and are not supplied with the BoomVane.

Bridle & Bridle Block

Check that the main bridle is securely connected by the two shackles to the BoomVane main wing frame. Ensure there are no knots in the bridle line and that it runs freely through the main bridle block. Any jamming may cause the BoomVane to ‘porpoise’ when deployed.

Control Line Block and Control Line

The control line block is suspended on a short cable below the main bridle block. Ensure the control line block is running freely.

To hook up the control line, run it through the small control line block (fastened by a wire strop to the main bridle block), and tie it (bowline knot) to the shackle on the center rib of the control rudder.

Note! Always use the appropriate line for the control rudder. A line with too much drag may result in the rudder swinging over without any action from the operator.
Mooring/ Tow Line

The *BoomVane* mooring line must be low-friction and of small diameter to minimize drag - thereby allowing for a longer boom to be deployed. Low-stretch is important to minimize sagging. The line should have neutral buoyancy to minimize the risk of snagging on underwater/bottom objects, during launching. A line with a break load of min. 6500 kgf is required for the standard *BoomVane*, 4500 kgf for the shallow water model. The *Dyneema* lines delivered with the *BoomVane* comply with all the above requirements and are fitted with a stainless steel thimble on the end for the connector plate shackle, as well as with a float to compensate for the connector plate weight in the water. Use of other lines is not recommended.

Connector Plate

The triangular connector plate of stainless has shackle holes at each point – two holes diam. 13 mm, one hole diam. 10,5 mm. If the connector plate is stood on its shortest side the top hole is for the shackle of the mooring line to the upstream anchor point. The *BoomVane* bridle is attached to the 10,5 mm shackle point and the third hole (13 mm) is for the oil boom shackle.

Connecting the oil boom

The line used to secure the oil boom to the connector plate should not be too short (<5m), or the head of the oil boom will be dragged under water - especially if the boom towing end has no float. If the line sinks, it can be fitted with a float near the middle to ensure that it cannot snag under the *BoomVane* during launching. The line should also have a diameter of no less than 25 mm (1”) - see 7 - Hints on handling.

... essential knots:

![Diagram of essential knots](image)

The bow-line will always open when relieved. Recommended for all applications where no trimming is required.

Two turns or more + a double hitch allows line to be paid out under load - recommended for onshore-side mooring points.

Do not underestimate the load on the system lines, in particular the mooring/tow line. As a safety precaution, during shore-based operations, always take the *BoomVane* back to shore by operating the control rudder, thus taking most of the load off the line, before attempting to adjust the line length. This rule also applies when paying out line.
7 - Hints on handling

What to do if the oil boom sags (too baggy, too much “J-curvature”)?

- ‘Heading’ relative to the oil boom mooring point can be gained by mooring the BoomVane further ‘out’ [towards mistream] - if such alternative mooring point is found - thus running the mooring line more parallel to the current.

- Increase the distance between the two shore moorings by moving either the upstream or downstream point. Thereafter, lengthen the mooring line if/as required to achieve an effective boom geometry - see further appendix 1.1 (Deployment geometry). The last alternative is to shorten the oil boom.

What to do when there is no current near the shore to ‘start the BoomVane off’?

Should the current near the shore be insufficient for ‘launching’ the system (<½ knot) - but stronger further out - a line can be inserted between the connector plate and the bridle block (like in the previous example) to allow the BoomVane to reach the stronger current and thus gaining additional force to straighten out the oil boom.

NOTE! To insert a line between the connector plate and the vane bridle block - as in the above noted special cases - a hex driver is required for opening the shackles. (Such shackles are used in the BoomVane system wherever the shackles are NOT opened in typical operation or storage handling).
How to avoid the BoomVane coming in too fast towards shore when being retrieved, making it difficult to stop and send back out again?

... or, what to do when the BoomVane will not go out again after having been retrieved?

A ‘back-water flap’ is delivered with the BoomVane to facilitate safe system retrieval. When the BoomVane is retracted from mid-stream, it is easy to pull the control line to far/hard. That may swing the BoomVane around so far that water starts flowing through the wing cascade from the wrong direction whereby the BoomVane will come in too fast to stop and reverse, grounding itself in muddy river banks. The back-water flap, which in normal operation will just stream with the current, will stop this from happening. If the rudder is swung around too far and water starts flowing through the cascade from the back, the flap will close the cascade and the return and subsequent re-positioning in mid-stream is facilitated.

The back-water flap stops back-flow through the cascade when the control rudder steers the BoomVane towards shore.

Note regarding earlier BoomVane models without control rudder return springs:

If the stabilizer arms are pulled up too far (as in the 3:d sketch above), the control rudder may have difficulties swinging back to ‘drive’ position again when the control line is released. In river operations, the operator can resolve this by setting the control rudder right with e.g. a boat hook. If the optional control rudder return springs are mounted, this manual re-setting of the control rudder is not required. In vessel sweep operations, where the control rudder cannot be reached in this way, the control rudder return springs are essential.

Also note that if a strop/line is used to connect the boom to the connector plate (as in the sketches above), such a line should be of such diameter (min. 25 mm / 1”) that it cannot wedge itself in between the control rudder and a stabilizer arm, thus jamming the control rudder.
8 - Technical specifications

Materials:

Vanes, rudder & stabilizer wing: aluminum 6082-T6 [Int. AA]
Frame: aluminium 5083-T6 [Int. AA]
Stabilizer arms: aluminum 6063-T6 [Int. AA]
Float: GRP, foam-filled (EPS & PU)
Connector plate, pins, bolts & shackles: all stainless steel

Mooring/tow line:
standard model: \textit{Dyneema} 12 mm x 150 m
breakload >7000 kgf
shallow water model: \textit{Dyneema} 10 mm x 100 m
breakload >5000 kgf

Bridle line: \textit{Dyneema} 10 mm,
Control line: 4 mm x 150 m trim line
Blocks: \textit{Ronstan or Rutgerson}
Control rudder return springs:
plastic coated GRP rods, aluminium holders

Draught:

1.1 m (standard model)
0.55 m (shallow water model)

Overall dimensions & weight:

Wing unit: 1785 x 310 x 1012 mm = 0.56 m³, 46 kg (standard model)
1785 x 310 x 505 mm = 0.28 m³, 34 kg (shallow water model)
Float unit: 1400 x 205 x 800 mm = 0.23 m³, 16 kg

Performance:

Boom length*:
Standard model: 100-150 metre (300-500 feet) shallow draught boom
Shallow water model: 50-100 metre (150-300 feet) river boom
Water speed range: 0.5-5 knots

* (typical - varying with type/size of boom and site conditions)
9 - Maintenance

- Store in dry atmosphere, out of direct sunlight.
- Always rinse in fresh water after use in the sea.
- Use only mild detergents and solvents on the float, rinse thoroughly with fresh water. Hot water/high pressure cleaning of float should be avoided.
- Check all lines for chafing etc – replace on any sign of wear and tear.
- For repair of damages to the float, epoxy filler and laminate is recommended. Thoroughly clean and dry the damaged area before application.
- Check and replace all bent or worn shackles, bolts and other fittings.
- Check rudder bearings and washers for wear and tear – replace in good time.
- Check the control rudder return springs - apply a drop of grease on the rudder blade, where the spring rod ball rests.
- Use only original spare parts from ORC, whenever possible.

Replacing control rudder shaft bolts, bearings and slide washers - tighten only until the play of the washer is eliminated. Do not over-tighten the bolts – the rudder should turn easily.

Also refer to these sketches for BoomVane conversion kits

Replacing the stabilizer arm slide washers - tighten the lock nut until all play is eliminated, then some more.. the arms should slide rather stiffly.

The back-water flap is dismantled by removing the key-ring at either end of the steel rod, then sliding out the rod.

If the stabilizer arms are to be dismantled, note - before dismantling! - that the two arms differ in that the hole geometry is mirrored (control rudder shaft hole not being centered).
Fitting/ replacing control rudder return springs

The springs are delivered in pairs (mirrored) and are mounted on both stabilizer arms using the stabilizer wing bolt and nut (the washer is excluded).

The procedure below applies to both mounting new/ replacement springs and remounting of the spring holder plate when it has ‘come off” when removing or inserting the stabilizer wing bolt.

*Turn the rudder to active/drive position (resting fully on the stoppers).*

*With the spring rod on the inside of the rudder blade, twist by hand the spring holder plate so that the stabilizer arm fits between the two end stops (Allen screw heads) of the spring holder plate.*

*Then, slide the spring holder plate along the stabilizer arm so that the bolt hole in the holder plate is aligned with the stabilizer wing bolt hole. Insert the coach bolt and tighten the wing nut firmly by hand.*
10 - Conversion kits & accessories

Shallow water model

For oil boom deployment in very shallow rivers and waterways (depth < 1 metre) there is a shallow water model of the BoomVane.

To reduce overall system costs, the shallow water model utilises, as far as possible, the same system components as the full size (standard) model. Only the main wing assembly, the control rudder and the back-water flap differ - these are halved in height, giving the shallow water model a draught of approx. 550 mm.

The shallow water model can be ordered either as a complete unit, or as a conversion kit to the standard BoomVane. With a shallow water conversion kit and the stabilizer arms and wing of the standard BoomVane, a shallow water model can be assembled following the steps noted for the standard model.

However, we recommend a different mooring line diameter for the shallow water version - the lighter load requires only a 10 mm Dyneema line. (By reducing the line diameter, total drag is also reduced - enhancing BoomVane performance.)

Vessel sweep applications

For vessel sweep applications, the BoomVane must be equipped with control rudder return springs that are mounted on each of the stabilizer arms. As of 2004, all Boomvanes are delivered with control rudder return springs, but the springs can also be fitted on earlier models - contact ORC for recommendations.

Safe navigation

To ensure safe navigation in the vicinity of a site of operations, the following optional accessories can be mounted on the BoomVane float:

Oil recovery

In principle, any fast water skimmer can be used with the BoomVane system. However, the River Circus by ORC is developed for this particular application. The River Circus is an artificial lagoon-type skimmer that allows recovery of oil, with a minimum of water. It is easily carried by two men, hooks up and is launched in minutes. Contact ORC for detailed info.
## 11 - Spare parts list - *BoomVane*

<table>
<thead>
<tr>
<th>article</th>
<th>mtrl./make</th>
<th>part no</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wing frame (complete conversion kit incl rudder)</td>
<td>aluminium</td>
<td>BV-STD* 1000-00</td>
</tr>
<tr>
<td>&quot; wing frame only</td>
<td>aluminium</td>
<td>BV-SW** 1100-00</td>
</tr>
<tr>
<td>Float (complete kit)</td>
<td>foam-filled GRP</td>
<td>1001-00</td>
</tr>
<tr>
<td>&quot; bolt, washer, wing nut (x2)</td>
<td>stainless steel</td>
<td>1001-01</td>
</tr>
<tr>
<td>Stabilizer arm pair (complete kit)</td>
<td>aluminium, foam filled</td>
<td>1002-00</td>
</tr>
<tr>
<td>&quot; hinge bolt incl. washer, lock nut (x2)</td>
<td>stainless steel</td>
<td>1002-01</td>
</tr>
<tr>
<td>&quot; lock bolt incl. washer, hairpin (x2)</td>
<td>stainless steel</td>
<td>1002-02</td>
</tr>
<tr>
<td>&quot; hairpins (x5)</td>
<td>stainless steel</td>
<td>1002-03</td>
</tr>
<tr>
<td>&quot; slide washers (x4)</td>
<td>polyethylene</td>
<td>1002-04</td>
</tr>
<tr>
<td>Stabilizer wing (complete kit)</td>
<td>aluminium</td>
<td>1003-00</td>
</tr>
<tr>
<td>&quot; bolt incl. washer &amp; wing nut (x1)</td>
<td>stainless steel</td>
<td>1003-01</td>
</tr>
<tr>
<td>Control rudder (complete kit)</td>
<td>aluminium</td>
<td>1004-00</td>
</tr>
<tr>
<td>&quot; shaft bolt, washers, lock nut (x2)</td>
<td>complete assembly kit</td>
<td>1004-01</td>
</tr>
<tr>
<td>&quot; bearing (x2)</td>
<td>acetate</td>
<td>1004-02</td>
</tr>
<tr>
<td>&quot; slide washer (x2)</td>
<td>polyethylene</td>
<td>1004-03</td>
</tr>
<tr>
<td>&quot; end stop bushings (x4)</td>
<td>acetate</td>
<td>1004-04</td>
</tr>
<tr>
<td>Control rudder return springs (set of 2)</td>
<td>alu., plastic coated GRP</td>
<td>1004-05</td>
</tr>
<tr>
<td>Lift-eye bracket</td>
<td>aluminium</td>
<td>1005-00</td>
</tr>
<tr>
<td>Connector plate</td>
<td>stainless steel</td>
<td>1006-00</td>
</tr>
<tr>
<td>Back-water flap (complete kit incl.rod)</td>
<td>stainless steel</td>
<td>1007-00</td>
</tr>
<tr>
<td>&quot; rod, spacers, key-rings</td>
<td>reinforced PVC fabric</td>
<td>1007-02</td>
</tr>
<tr>
<td>&quot; flap</td>
<td></td>
<td>1107-00</td>
</tr>
<tr>
<td>Bridle (complete kit)</td>
<td></td>
<td>1008-00</td>
</tr>
<tr>
<td>&quot; bridle block (incl shackles &amp; control line block)</td>
<td><em>Ronstan/Rutgerson</em></td>
<td>1008-01</td>
</tr>
<tr>
<td>&quot; control line block, wire strop, eyebolt</td>
<td><em>Ronstan/Rutgerson</em></td>
<td>1008-02</td>
</tr>
<tr>
<td>&quot; 7 m x 10 mm bridle line with thimble ends</td>
<td><em>Dyneema, stainless steel</em></td>
<td>1008-03</td>
</tr>
<tr>
<td>&quot; bridle shackles (x2)</td>
<td>8 mm stainless steel</td>
<td>1008-04</td>
</tr>
<tr>
<td>Control line (with A4 shackles, on reel)</td>
<td>4 mm Trim line x150 m</td>
<td>1009-00</td>
</tr>
<tr>
<td>Mooring lines, <em>Dyneema SK75</em> (one end with ss eye)</td>
<td>12 mm x150m</td>
<td>1010-01</td>
</tr>
<tr>
<td>Wing nuts x5 (fits float bolts and stabiliser wing bolt)</td>
<td>stainless steel</td>
<td>1011-01</td>
</tr>
<tr>
<td>Shackles x2 (mooring line-, boom line-)</td>
<td>stainless steel</td>
<td>1012-01</td>
</tr>
<tr>
<td>Holders (for flash lites and radar reflectors)</td>
<td>alu + 40 mm clamps (flash)</td>
<td>1013-01</td>
</tr>
<tr>
<td>Flash lite (day-light sensor)</td>
<td><em>specify white or orange flash</em></td>
<td>1014-00</td>
</tr>
<tr>
<td>Radar reflector</td>
<td>tube type, 500 x 54 mm</td>
<td>1015-00</td>
</tr>
</tbody>
</table>

* *BoomVane* standard model  ** *BoomVane* shallow water model