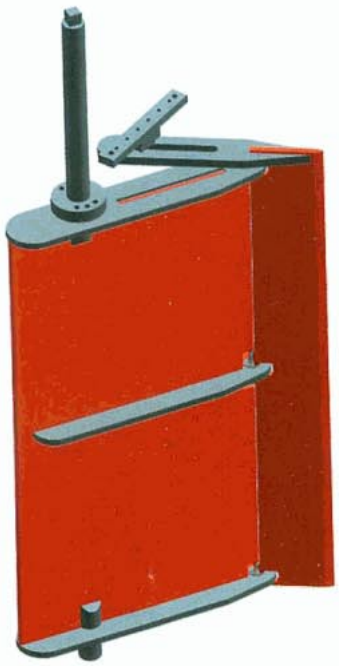
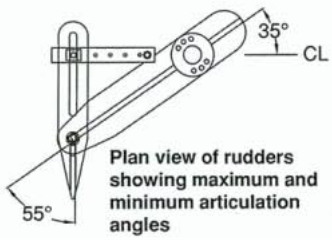
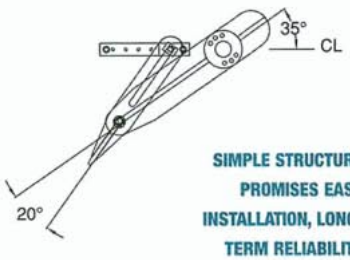




Plan view of rudders showing maximum and minimum articulation angles



SIMPLE STRUCTURE PROMISES EASY INSTALLATION, LONG-TERM RELIABILITY

LIA FAIL, A 151' TRI-DECK BY NORTHERN MARINE, WAS FITTED WITH BARKMEYER ARTICULATING RUDDERS AS ORIGINAL EQUIPMENT

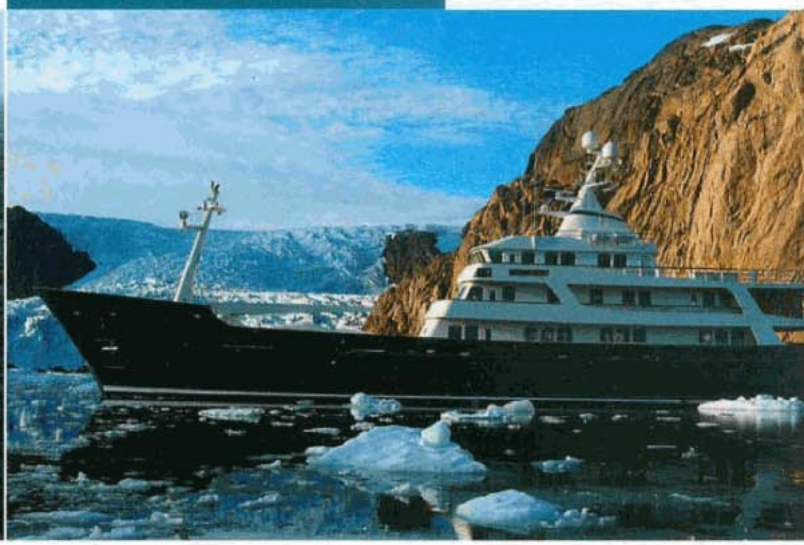
ONE GOOD TURN

Articulating Rudders

IF SIMPLICITY IS A CORNERSTONE OF SMART ENGINEERING, THEN THE ARTICULATING RUDDER MAY PROCEED TO THE HEAD OF THE CLASS. YET FOR ITS ABSENCE OF COMPLEXITY, THE CONCEPT HAS PROVED ITSELF ENORMOUSLY EFFECTIVE OVER DECADES OF COMMERCIAL USE, AND MORE RECENTLY HAS EARNED THE ACCLAIM OF MORE THAN A FEW YACHT OWNERS.

Story Jerry Stansfield
Photography Royal Denship, Northern Marine; graphics BEI

FEADSHIPS 235' *UTOPIA* (LEFT) HAS HINGED RUDDERS TO HELP WITH ITS DYNAMIC POSITIONING SYSTEM, WHILE THE 209' ROYAL DENSHIP *TURMOIL* HAS STEERING CONTROL WHEN SKIRTING ICE AT DEAD SLOW SPEEDS THANKS TO RUDDER FLAPS



Apart from the conventional one-piece blade rudder it's difficult to imagine a more straightforward design, typically made up of a narrow flap extension, hinged to the main rudder plate's trailing edge and activated by the travel of the rudder itself. A slotted arm or similar link extending forward from the top of the flap engages a pin mounted to the hull bottom or other fixed point near the rudderstock. The resulting geometry causes the extension to swing faster than the main rudder plate, increasing lift generated by the entire assembly to deliver a tighter turning radius for significantly improved maneuverability, particularly at low speeds.

Articulating, or flap, rudders have been around for decades, and over that time have enjoyed widespread favor in the commercial marine sector, taking their place alongside the Kort nozzle and multiple-vane systems to improve tugboat operations and enhance close-quarters maneuvering for larger vessels. More recently, their installation on motoryachts has produced similar results.

"We consistently hear comments like 'Wow, this is better than I expected' from our customers when they first try their new rudders," says Lowell Stambaugh, president of Deflector Marine Rudder, a Pacific Northwest-based design and fabrication shop serving commercial and pleasure craft clients. The initial reaction, he notes, typically results from their first hard-over full-circle turn at idle speed, a maneuver often completed within a diameter close to their boats' length. Bruce Kessler, owner of the much-traveled 64' Northern Marine expedition cruiser *Spirit of Zopilote*, reports that his boat, following a refit with an articulating rudder by BEI, was able during trials to complete a figure 8 just inside the turning circle produced by the original, conventional rudder.

So how does the addition of a flap create so significant an improvement? While the concept and finished product may be simple, designing an articulating rudder requires detailed calculations to establish ideal balance—the ratio of rudder surface areas forward and aft of the rudderstock's axis—and the relationship between rudder angle and flap angle. In a manner similar to the flap system on an airplane wing, the rudder flap generates increased lift at the training edge of the main rudder to exert a greater turning force as water moves across its surface. This effect also allows an increase in rudder surface area forward of its axis, in turn enabling the rudder to engage a greater part of propeller flow, compounding the extra lift from the flap itself for more immediate response to helm commands. According to Kessler, the system's performance on his single-screw vessel easily overcomes the turning resistance of the bulbous bow, an especially valuable attribute for docking and slow-speed maneuvering in rivers or areas of tidal flow. Captain Philip Walsh of the Royal Denship *Turmoil*, a 209' expedition yacht fitted with a pair of articulating rudders by Ulstein-Hinze, also appreciates the improved maneuverability, especially during the yacht's visits to the glacier-strewn fjords of Greenland, where he can negotiate narrow reaches and deftly avoid ice without the use of thrusters.

Flap rudders also are effective at cruise speeds. Given their more immediate lift, and consistent with the helmsman's mantra "steer small," they respond to minute corrections for rock-steady course-keeping with or without autopilot. Indeed, Kessler indicates that the autopilot on *Spirit of Zopilote* works 50% less than it had with the original, conventional rudder. Stuart Archer, vice president of BEI, advises that autopilot systems on vessels refitted with articulating rudders may require re-calibration to make smaller corrections when holding course in order to avoid hunting back and forth.

Owners considering the installation of flap rudders on their yachts should note that the typical refit can be as simple as the unit itself, normally requiring few or no modifications to the existing steering system, although care should be taken to ensure that rudder post bearings can handle the load of increased turning force. In any case, the payoff can be well worth the moderate cost, even if only when turning into a stiff breeze within a small harbor, or looking every inch the pro when coming alongside in tight quarters. For the egotists among us—and we know who we are—the latter benefit may well be the most compelling motivation to make the change.

For information contact: Ulstein Hinze, www.rolls-royce.com/marine; BEI, www.bayviewedisonindustries.com; Deflector Marine Rudder, www.rudderpower.com; Barke Rudder, www.vdveldengroup.nl