Floating Island

Harvey Gulf's new LCV can stay on-station for an extended period and boasts large capacities and a helideck.

The *Harvey Deep-Sea* has one of the most advanced status-and-control systems of any offshore support vessel.

Eastern Shipbuilding Group

By Max Hardberger, Correspondent

Modern subsea technology has freed oil companies from the confines of shallow water, allowing drilling in water up to 10,000', but daunting challenges remain.

The *Deepwater Horizon* blowout and oil spill underscored the importance of getting it right at depths where everything has to be done by remote control at crushing pressures in almost total darkness. That's where **Harvey Gulf International Marine**'s new ultradeepwater installation vessel, the 302'×64'×24'6" *Harvey Deep-Sea*, comes in.

At first glance, the multipurpose light construction vessel (LCV) hints at its capabilities. A 68'6"-dia. heliport deck on the bow, above the level of the wheelhouse, provides for crew changes without returning to base. A 165-MT **National Oilwell Varco** (NOV) knuckle-boom crane on the afterdeck is designed to handle large, heavy loads in high seas. And the size of the *Deep-Sea*'s house forward indicates her capacity for storage and accommodations well suited to her far-offshore mission.

"We designed the *Harvey Deep-Sea* from the outset as a 'floating island,' " said Jules Schubert, the New Orleans-based company's executive vice-president for operations. "At long distances from shore, support vessels have to stay on-station for extended periods of time. That's why we specified large capacities and a helideck."

CRANE SUPPORT

The *Deepwater Horizon* blowout brought the world's attention to subsea operations. The failure of the subsea blowout preventer (BOP) for the

Macondo well emphasized the importance of getting the right subsea equipment and procedures in place when structures weighing hundreds of tons have to be placed in service 10,000' below the surface of the sea.

That's when the capabilities of the NOV 165-ton crane come to the forefront. "The boat is really, in some ways, just a support vehicle for the crane," explained Schubert. "With the crane's sophisticated, computer-controlled positioning system, the tip of the boom can be held within a 3'-dia. area above a spot on the ocean floor while equipment weighing up to 100 tons, suspended up to 60' off the side of the ship, is put in place."

The crane has a computer-controlled "auto-heave compensation" (AHC) system consisting of nitrogen tanks, piping, and valves to provide the high-speed boom and runner movements necessary to compensate for roll and heave. Stability is also helped by the vessel's anti-heel system, a complex arrangement of computer-operated, high-volume pumps and pipes that transfer ballast water from one side to another as a load is swung over the side. Working together, these systems provide the necessary accuracy and stability to handle crane load in seas up to 15' and in currents up to 3 knots.

A 165-MT knuckle-boom crane on the afterdeck is designed to handle large, heavy loads in high seas.

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The *Harvey Deep-Sea*, like most DP vessels, has diesel-electric propulsion and maneuvering. Two **Schottel** SRP 2020 FP azimuthing stern thrusters provide propulsion, driven by two 3,350-hp motors, and three Schottel SST4FP bow tunnel-thrusters, each driven by a 1,581-hp motor, provide increased maneuverability. Electricity for the thrusters and house load comes from four **Hyundai** generators driven by four **Caterpillar** 3516C Tier 4 (interim certified) diesel engines that produce 2,250 kW each (for a total of 12,069 hp). The generators can work in synch to supply 9,000 kW of electric power.

"We have one of the most advanced status-and-control systems in the world," said Darrel Beckham, the *Deep-Sea*'s chief engineer. "Over 400 alarm sensors in the machinery systems report back to consolidated alarm panels in the engine room control center and in the wheelhouse. Firefighting systems, bypass controls and electrical switching are all done by remote control." And in case of loss of computer memory, all engine parameters and control actions are recorded in real time on two continuous-scrolling printers, with printouts stored for two years.

The electronics for the machinery systems are so complex, Beckham said, that they require their own cooling-water system, connected to a separate keel cooler on the vessel's hull.

"We want to be a full-service supply vessel," said vessel master Capt. Jace Callais. "Whether it's carrying drill pipe or other standard cargo, or installing sophisticated subsea well-heads and pumping stations 10,000 feet down, this boat was designed to do it all."

One way in which the vessel's supply-boat role reveals itself is in its 200-ton stern roller, with a removable stern bulwark for access. But even her working afterdeck had to be modified to fit its subsea-support role. To keep large, heavy hook-loads low, a 40' section of the afterdeck's starboard side

HARVEY DEEP-SEA SPECIFICATIONS

Builder: Eastern Shipbuilding Group
Designer: STX Marine; Eastern Shipbuilding Group
Owner: Harvey Gulf International Marine
Mission: Subsea installation and maintenance/offshore supply
Length: 302' **Beam:** 64'
Depth: 24'6" **Max. Draft:** 20'
Main Propulsion/Ship's Service Power: (4) Caterpillar 3516C Tier 4 (interim certified), 2,250 kW (12,069 hp total); (4) Hyundai generator
Z-Drive: (2) Schottel SRP 2020 FP azimuthing stern thruster, 2,500 kW
Speed (knots): 14
Hull Construction: Steel
Cargo Deck: 196'x56'; 3,175 MT
Crew/Passenger Capacity: 71
Electronics/Navigation Equipment: Furuno radars and communications gear; Kongsberg DP system; CyScan laser; Kongsberg HiPAP, RADius acoustic positioning system
Tankage: Fuel, 396,300 gals.; drill water, 613,100 gals.; potable water, 25,210 gals.; liquid mud, 18,870 bbls.; methanol, 1,710 bbls.; dry bulk material, 8,200 cu. ft.
Moon Pool: 15'x18'
Ancillary Equipment/Systems: 165-MT National Oilwell Varco (NOV) AHC knuckle-boom subsea crane; (3) FFS fire monitor, 16,192 gpm, with foam
Classification/Certification: ABS A1, OSV, AMS, DPS-2, ACCU, ACP, ENVIRO PLUS, GP, FIFI 2, UWILD, Circle E, CRC, HELIDK; full SOLAS compliance
Delivery Date: July 19, 2013

bulwark, aft of the crane pedestal, was made to be removable.

"If we're putting a huge platform on the bottom at 10,000 feet down with a sea running," Callais said, "the 10-foot height difference could make a big difference in controlling the load."

To do this, designers placed all of the tank vents that would have been in the way of the removable bulwark on the other side, and provided nut-and-bolt connections in all of the places where the bulwark and its supports would have been welded to the hull.

TASK ORIENTED

The *Deep-Sea*'s large 196'×56' afterdeck is the equal of any dedicated supply boat, capable of carrying up to 3,175 MT. Even here, the subsea support role stands out. A 15'×18' moon pool is located in the center of the afterdeck, fitted with a cover to make the deck continuous when the moon pool isn't being used.

"Being able to locate the boom tip over the vessel's centerline [while working through the moon pool] greatly reduces the tip's motion in a seaway," said Callais. "Having a moon pool on a vessel that can also serve as a deck-cargo carrier is pretty unique."

Another supply boat feature, but sized in keeping with the *Deep-Sea*'s "the-most-of-everything" philosophy, is its big firefighting capability. The three remote-controlled fire monitors that bracket the wheelhouse can each throw 16,192 gpm at a burning rig or platform, as well as 60 minutes of foam.

But its primary mission as a far-offshore subsea installation and support vessel, performing the most demanding tasks today's OSVs face, is always paramount. To support that mission, it has two ROV bays, one on the port-side main deck and one on the mezzanine deck, for customer-supplied 220-hp work-class ROVs. The *Deep-Sea* has a crane capable of precisely positioning a 100-ton load and holding it in place while the ROVs bolt it down. And the vessel has the GPS, radar, acoustic, and sonar positioning systems to do it safely and efficiently.

The 21-meter-diameter helideck on the bow, above the level of the wheelhouse, provides for crew changes without returning to base.

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The vessel's complex navigation system includes three **Furuno** GPS Navigator 150 global positioning system receivers, three RS232/RS485 gyroscopes, and three local reference systems: a CyScan laser system, a **Kongsberg** HIPAP 500 acoustic positioning system with two acoustic wells in the hull underbody, and a RADius 17 X-band radar-sounder.

With tankage for 8,200 cu. ft. of dry bulk cargo and 18,870 bbls. of liquid mud, the *Harvey Deep-Sea* can compete with any of today's large OSVs in rig supply mode. It also has tankage for 613,100 gals. of drill water, 1,710 bbls. of methanol, and a staggering 396,300 gals. of diesel fuel.

"A fuel stop for the *Harvey Deep-Sea* is an expensive proposition," laughed Schubert. "At today's prices, it costs $1,400,000 to top off her tanks."

The *Deep-Sea* has an "endurance speed" range of 20,721 nm at 8 knots and 16,450 nm at 12 knots. It can go two-thirds of the way around the world without refueling. And with a potable-water capacity of 25,210 gals., the voyagers won't get thirsty.

It won't have to make unnecessary port calls for personnel changes, either. With a support structure of aluminum girders to save weight, the helideck is out of the way of afterdeck work, avoids obstructions like masts and funnels, and provides easy access for personnel. "And it does a great job of shading the wheelhouse," said Callais.

The *Deep-Sea* has a cruise ship feel with its spacious accommodations. And the trip down from the helideck won't disprove it. There is a stainless-steel chute with a trapdoor at the bottom that allows arriving passengers to drop their bags off on the helideck and retrieve them at the bottom of the ladder.

The cruise-ship feel is carried through with plank-and-strip floors and solid-wood furniture. Each of the 34 cabins (20 have only one or two berths) has its own head. And there's plenty of space for work. In addition to the wheelhouse work spaces, the boat has three offices for contractors and a conference room for 12.

A vessel of this complexity and size has to last a long time to recoup its design, development, and construction costs, and the *Harvey Deep-Sea* was built for longevity. Almost all the steel in the LCV other than the hull and house structures is stainless, and even the anchor chains are galvanized.

Today's far-offshore oilfield boats have to do almost everything and do it well, concluded Schubert. "That's what the *Harvey Deep-Sea* was designed and built to do." WB