PELICAN AND HER 11 SISTERS

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PELICAN, CO 860

In the offshore industry a successful design may be built many times. An example in case is the Aker H3 semi-submersible, or closer to home, the CJ series jack-ups designed by GustoMSC. Few designs have been so successful as the Pelican dynamically positioned drillship, which dominated the DP drillship market for some twenty years, until the industry made a quantum jump towards very deep water vessels. This document is an effort to describe the main features of the design and to lay down the memories of a number of people involved in the design, construction and operation of the ships.

Prelude

The story goes that in the early 1960s, Mr. Pieux, director of the French drilling company Forasol[1], visited the offices of BIPM in The Hague to inform himself about offshore drilling technology *[SBM Offshore, Technology creating value, page 46].* Forasol had been invited by the French oil company CFP (brand name Total) to tender for offshore drilling off Senegal. At the end of the discussion, Pieux was referred to Werf Gusto and RDM in case he wanted to talk with potential platform builders. A visit to Gusto was feasible on the same day, a visit to RDM might compromise his return flight to Paris. And so Gusto and Forasol became partners in business. Pieux offered Gusto a 50% participation in a new offshore drilling company to be established. Gusto found it difficult to bring in 50% of the required capital[2] and ultimately Foramer was founded with Forasol, Gusto and the Belgian dredging company Ackermans & van Haaren as equal shareholders.

Another explanation of the long standing relation between Gusto and Forasol is through Ackermans & van Haaren, a 50% shareholder in Forasol since its inception in 1958. Private relations existed between the Smulders and Ackermans families: the mother of August (Guus) Smulders was mrs. M.H.C. Ackermans. Guus was instrumental in the offshore projects that Gusto had executed for Shell. Before becoming a director of Gusto, Guus had worked in the Shell engineering group in London. His father-in-law was a Shell director.

The first project for Foramer was the building of a jack-up, Ile de France. Then, mid 1969, CFP again asked Foramer to tender for offshore drilling. CFP had done initial study and design work, performed by Breit Engineering of New Orleans, and had something special in mind to be able of drilling in the ice-infested waters offshore Labrador: a dynamically positioned drillship. Based on the experimental DP work done by the IFP[3] ship “Térébel” and the successes of the “Glomar Challenger”, there was confidence in the feasibility of dynamic positioning on larger ships. Gusto made some changes to the preliminary design and secured a building contract for Dfl 40.4 million, not including drilling systems.

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[1] Forasol was a 50/50 subsidiary of BTP Soletanche en Ackermans & van Haaren established in 1958; in March 1997 it merged with Pride.

[2] Gusto tried to interest its IHC partners to participate, but failed to convince them that there was more than dredging only. In 1965, when the partnership was changed in a NV, the original yard owners, now shareholders, were participating after all.

[3] IFP stands for Institut Français du Pétrole.

Design Phase

The preliminary design for a DP drillship, on which Gusto was to bid, included a number of features quite different from the ship types which Gusto had been building so far. It also differed from most drillships in operation in the late sixties *["Offshore mobile drilling units" by R.J. Howe, Ocean Industry July 1968]*. The table below lists the self-propelled drillships since the first conversions were done by Submarex and Global Marine. The most famous one among them, Glomar Challenger, in operation since 1968, was the first to utilize Dynamic Positioning on a large ship; other DP ships were small, research-type vessels. Glomar Challenger was equipped with two main propellers, two transverse thrusters in 57" bow tunnels and two in stern tunnels.

Year	Name	Owner	Dimensions (m)
1953	La Busca (drilling over the side)	Submarex Corp	41.5 x 7.3 x 3.7
1954	San Dab V	Submarex Corp	41.5 x 7.3 x 3.7
1955	Submarex (drilling over the side)	Global Marine	53 x 7 x 2.4
1955	La Ciencia (drilling over the side)	Global Marine	41.5 x 7.3 x 3.7
1956	Torry	North Sumatra Development Co	53.6 x 10.7 x 3.7
1956	Exploit (drilling over the side)	Wodeco	53.0 x 7.0
1957	SM-1 (sank 1961)	Global Marine	62.2 x 10.4 x 4.0
1961	Eureka (DP)(coring)	Shell Oil Co	41.5 x 7.3
1962	Glomar II **(first newbuilt**)	Global Marine	81.7 x 17.7 x 4.6
1962	Glomar III	Global Marine	81.7 x 17.7 x 4.6
1963	Glomar IV	Global Marine	81.7 x 17.7 x 4.6
1963	Glomar V	Global Marine	81.7 x 17.7 x 4.6
1963	Discoverer I	The Offshore Company	97.5 x 21.3 x 7.6
1964	Calldrill I (DP)	Coral Drilling Co	53.7 x 10.1 x 4.0
1964	Tankaigo No 1	Pacific Offshore Exploration Co	45.7 x 9.1
1965	Glomar Sirte	Global Marine	115.8 x 19.5 x 5.8
1965	E.W. Thornton	Reading & Bates	84.7 x 32.0 x 10.4
1966	Reforma	Compania Peroradora	111 x 22.9 x 8.2
1966	Revolucion	Compania Peroradora	111 x 22.9 x 8.2
1966	Glomar North Sea	Global Marine	115.8 x 19.5 x 5.8
1966	Glomar Tasman	Global Marine	115.8 x 19.5 x 5.8
1966	Independencia	Pemex	110.9 x 22.9 x 8.2
1967	Drill Ship	Drill Sea Associates	193.5 x 23.5
1967	Glomar Grand Isle	Global Marine	121.9 x 19.8 x 6.4
1967	Glomar Conception	Global Marine	121.9 x 19.8 x 6.4
1968	**Glomar Challenger** (DP)	Global Marine	121.9 x 19.8 x 6.4
1968	Goldrill V	Golden Lane Drilling Co	106.7 x 21.3 x 8.8
1968	Goldrill VI	Golden Lane Drilling Co	63.4 x 16.5
1968	Discoverer II	The Offshore Company	109.7 x 21.3 x 7.9

To what extent Breit Engineering was involved in or influenced by these designs, is not known to us.

In the CFP/Breit design, a moonpool was arranged midship with a drilling derrick and drillfloor positioned above it. The crew accommodation and wheelhouse were placed on the forecastle and a helideck was arranged aft, essentially above the stern propulsion section. All

propulsion and shipboard power was generated by a diesel electric power plant. The hull itself had a relatively small freeboard and wide beam, typical for American designs. Drill string and casing pipe storage were in the open on the main deck. The two main aspects of difference with existing designs were Dynamic Positioning on a ship one and half time the displacement of the Glomar Challenger and the inclusion of "detuning tanks", highly positioned ballast tanks intended to shift the centre of gravity upward and thereby lengthening the natural period of rolling of the ship.

Gusto and Foramer jointly reviewed the design and ultimately came with a winning proposal. Jan Suyderhoud of Gusto's design office had meetings with Emilio Garcia of Breit Engineering to discuss the various aspects of the preliminary design. The bid was based on a somewhat modified design, having a larger freeboard and narrower beam than the Breit design. The idea was to reduce the rolling response in typical operating sea conditions (as was intended to be done with the detuning tanks) by relatively low initial stability and improving the dynamic stability by the larger freeboard. The large freeboard also provided for more hold space on the tween deck than was originally foreseen.

A new company Somaser[4] was formed to own this drillship and on 11 March 1970 Gusto and Somaser signed a contract in the amount of Dfl 40.4 million to design and build the "Pelican". It was an innovative ship type: a fully dynamically positioned (DP) drilling vessel for a maximum water depth of 320 m. The order was placed for delivery in 1972. Even for such an innovative vessel, the design responsibility was taken by the Shipyard.

As usual at the time, the drilling equipment was Owner Furnished Equipment (OFE) and was specified by Foramer with backing from CFP. Novelties in the drilling systems were the futuristic drillmasters cabin and the innovative Gusto crown block heave compensator with the patented Unicode pressure equalizer. Another innovation was the GAAA supplied horizontal pipe racking system, which later proved to present so many problems that after one year it was replaced by a conventional vertical pipe rack inside the drilling derrick. The moonpool area contained a maintenance and storage area for two subsea Blow Out Preventer stacks and a hydraulically driven sliding transport system over rails. Directly aft of the drilling moonpool was a second, smaller size pit for the advanced Doris-Comex saturation diving system bell. The total cost of the ship including OFE was in the order of Dfl 86 million and resulted in a rate of US$ 24 000 per day or Dfl 1 per second.

The basic propulsion and DP arrangement featuring 5 tunnel mounted transverse thrusters was maintained, after a short study of different thruster arrangements. In the same period SEDCO was designing a DP drillship for Shell Oil, using Schottel-type, right angle drive thrusters under the hull. This led to a large number of thrusters (11 arranged transversely, not azimuthing), because the maximum power of such units available at the time was 800 HP.

[4] A joint venture of Compagnie Navale de Pétrole on behalf of CFP, CG Doris (Compagnie Générale de Développement des Richesses Sous-marin) and Foramer. Doris was deeply involved in the diving and DP systems.

In the Rotterdam port, barges with Voith-Schneider propellers were used to build shore protections, and it was known that the maneuverability of this arrangement was very good. They seemed attractive, but after a visit by Gerrit de Wilt and George Lagers to the Voith factory in Heidenheim, Germany, this type was not chosen for reasons of efficiency and easy drydocking. Also the size required on Pelican would be first of its kind, whereas tunnel mounted CP propellers existed in 1500 HP as needed.

All propellers were to be controllable pitch units, driven by high voltage 1,500 HP AC motors: one motor for each tunnel thruster, two for each main propeller. KaMeWa was chosen as the supplier and on a cold winter day in 1970, Jan Suyderhoud and George Lagers travelled to the KaMeWa factory in Kristinehamn, Sweden, to explain what kind of performance was expected from these DP propellers. In DP mode, a CP thruster was expected to be varying its pitch continually, including multiple zero-pitch crossings. A typical feature of CP propellers is their power consumption at zero thrust, nearly 10% of full power. Although this was disadvantageous for fuel consumption, it was nice for reduction of the required power variation of the diesel generators. Pitch variations and the associated power variations would be faster than usual on ships, but CP propellers were basically fit for this.

The ships engine room would contain five diesel-generator sets to supply a 5.5 kV AC high voltage, split rail system. Total installed main power was 17,000 HP.

Pelican became the first full DP, anchorless Oil & Gas deep water drilling vessel in the world. The Sedco 445 had a spread mooring system in addition to its DP installation. To make sure…. or maybe for shallow water operations? The Pelican digital computer controlled DP system was developed from scratch by the French company Alcatel, assisted by Gusto with many calculations and tests done in collaboration with TNO and MARIN.

The DP control system was yard supply, but at the date of contract, nobody really knew what dynamic positioning would imply. While detail design of the hull and systems started, a small task force (Jos Koopmans and George Lagers) was formed to find out about DP and make sure that a system was specified, purchased, tested and successfully commissioned. Five potential suppliers were invited to bid and to explain their intentions during a full day visit to the yard. We, the yard, had most confidence in Honeywell, who had supplied the DP system for the Glomar Challenger. After the bid explanation sessions, in which Doris (Mr. Michel[5] & Mr. Vogt) participated on behalf of Somaser, our French clients explained that they wanted the system to be supplied by Alcatel, a Paris company we had never before heard of.

At an early stage, before the order for DP was placed, it was decided that – whoever the system supplier might be – the yard would set up simulations to double check proper performance of the system on a ship as big as Pelican, and to establish maximum seastate and wind conditions for the 5 tunnel thrusters and two main propellers of the vessel .

A hybrid (digital/analog) computer simulation set-up was developed by TNO-IWECO and based on extensive model testing at MARIN (then NSMB). This proved its value when long

[5] Dominque Michel became CEO of DORIS Engineering until 2007. He then joined Dietswell as Vice-President.

before actual sea trials, in October 1971, the DP system was tried out and consequently substantially improved. The simulations were performed by EAI in Brussels and combined an analog model of the ship with digital components in which the controller and the wave induced motions were programmed.

A unique feature of the design was the presence of wine tanks in the bow section. This was highly appreciated by the yard's crew during the sea trials, and for the French crew of Somaser, having a glass of wine for lunch was a condition sine qua. This feature was not repeated on the later sister ships.

The Pelican design had many more innovative features, such as large storage spaces below deck, guideline-free handling of seabed systems, automated drilling systems and power management and control systems. All these systems are now state of the art, but at that time not readily available and needed to be developed by the Gusto design team and their many subcontractors. Comfortable accommodation for the crew was provided as well as important new safety and redundancy issues satisfactorily solved and approval obtained from the oil company, relevant authorities and class.

The main features of the vessel were: Worldwide operations (both Arctic and tropical), 3 months' supply for 2 average or 1 deep well, capable of working between 50 and 300 meters water depth in 5 meter significant waves, with easy, safe and rapid handling of all drilling systems. Pelican proved its reliability and versatility many times, in particular offshore Labrador during summer and fall of 1973, where at one time she was surrounded by 19 icebergs within a 12 miles range.

Progress of the design was hampered somewhat by a strike in august 1970, which became known as the 400 guilder strike, the amount of money that nearly every industrial employee in The Netherlands received. This strike started completely unexpected at Wilton Feijenoord on August 25. The next day the Gusto labour force joined the strike and forced the white collar workers out of office. Bart Jan Groeneveld at the Product Development Department was ready to resist and start a fight, but of course had no chance against the blokes from the slipways. So the office staff left unwillingly.

During construction of Pelican, it appeared that lightweight and the vertical position of the centre of gravity were rising. Ultimately fixed ballast was placed in double bottom tanks to solve the reduction of the initial stability. The detuning tanks were never used as such. This experience led to increase of the design beam in later ships and addition of side sponsoons in nearly all ships of the Pelican series. The table below provides an overview :

First name	Delivery	Later names (starting)	Beam (m)	Waterdepth (m)
Pélican CO 860 IMO 7117266	1972 Scrapped 2004	Pélican II (1985) C.S. Nexus (1993, cable layer)	21.35	320
Havdrill CO 907 IMO 7305980	1973	Canmar Explorer III (1976) Explorer III (1997) Northern Explorer III (1997) Neptune Explorer (2005) Jasper Explorer (2010)	21.35 Increased to 23.78 to 29.75	400 Increased to 1500
Pétrel CO 947 IMO 7409401	1976	Oil Driller (1989) Pétrel (1990) Enterprise (1993) Seaway Falcon (1995, cable & pipelay) Acergy Falcon (2006)	21 .35	600
Pélerin CO 949 IMO 7411521	1977	Peregrine III (1996) Aban Abraham (2006, w/o derrick)	Increased to 27	1200 Increased to 2000
Polly Bristol CO 950 IMO 7422362	1981	KCA Kingfisher (1985) Boss Visgwa (1989) Neddrill 1 (1991) Noble Leo Segurius (1998) Paragon DPDS2 (2014)	Increased to 27 to 29.75	1500 Increased to 1700
Ben Ocean Lancer IMO 7402922	1977	S C Lancer (1990) Schahin Cury Lancer (1999)	23.5	1200 Increased to 1500
Pacnorse I IMO 7418880	1979	Peregrine II (1996) Frontier Phoenix (2005) Noble Phoenix (2010) Paragon DPDS1 (2013)	23.5 Increased to 33.5	1200 Increased to 1500
Valentin Shashin IMO 7907166	1981	Peregrine V (1998) Deep Venture (2007)	24 Increased to 28.8	300
Viktor Muravlenko IMO 7907178	1981 Scrapped 2015	Neddrill Muravlenko (1996) Noble Muravlenko (1997) Paragon DPDS4 (2012)	24 Increased to 28.6	300
Mikhail Mirchink IMO 7907180	1982	Onyx (1995) Peregrine I (1996)	24	300 Increased to 1500
Sagar Vijay IMO 8401183	1985	*Conventional mooring !*	24.5	900
Sagar Bhushan IMO 8407266	1987	*Conventional mooring !*	24.5	300

The IHC brochure “Dynamically positioned drillships” of 1977 gives a good description of the arrangement of the ship and its equipment. Therefore only the original main dimensions of Pelican are mentioned here:

Length between perpendiculars	137.00 m
Overall length	149.32 m
Beam	21.35 m
Depth	12.50 m
Design draft	7.32 m
Displacement	14 500 t

Design deadweight capacity	7 700 t
Drilling moonpool size	7.2 x 8.2 m
Maximum Water depth for drilling	320 m
Maximum Drilling depth	4500 m
Maximum Sailing speed	14 Kn

Construction

A ship is a ship, and most of the construction of Pelican was conventional. Exceptions were:

- Temporary reinforcements for launching in the moonpool and under the bow thrusters
- Suspension on rubber of the bow thruster tunnels, to reduce vibrations and noise in the accommodation right above the bow thrusters[6]. The rubbers between the tunnels and the ships hull were a difficult issue. The stern thrusters were rigidly mounted, since noise in the stern was of no concern.
- Detuning blocks on the bow thruster foundations, also to limit noise and vibrations
- Incorporation of the DP system with its components spread all over the ship
- Fitting the Owner Furnished Equipment, i.e. all drilling systems

The keel was laid on 7 december 1970. For assembly on the slipway the ship was subdivided into a number of blocks, which made the logistics of the many systems on board more manageable.

On 20 August 1971, the hull was launched and moored to the outfitting quay of the yard. The month of August had been very wet and as a result the painting of the hull was postponed. Nevertheless it had to happen before launching, and with a bit of desperation the coaltar epoxy coating was applied on the moist primer. As a result, large parts came off during the seatrials in March 1972. This was not the only worry for the yard: there also were issues with the quality of the butt welds of the hull. For the first time in the yards history, these welds were made automatically under CO2. Conditions during welding were often windy, and it appeared that the welds included many bonding faults, which Mr. Willemsen of Bureau Veritas insisted on had to be repaired. The job was completed very shortly before the launching date.

The christening was performed by Madame Jacques Benezit. That evening a dinner party was celebrated in Hotel De Witte Brug, in The Hague.

On behalf of Somaser, a team was present at the yard consisting of Messrs. Giraud (the gentleman), Gebhard (the playboy) and captain Petroni (the Corsican). In particular Petroni was a strong character, very much present. The yard's supervisor Peter Mackenbach regularly took them out for lunch at the nearby café (or should we say brasserie) De Klok, owned by Jan Krama. At such occasions usually the rest of the afternoon was wasted for work. In meetings the language of communication was English, until at one point in time

[6] In 1979 George Lagers and Dirk Manschot have tried to sleep in the bow quarters of the Hughes Glomar Explorer in operation, where the thruster noise was indeed horrendous.

Peter betrayed himself by reacting to some French discussion between his clients. Their reaction was immediate: "Ah, tu comprends Français, alors c'est terminé avec parler l'Anglais avec toi…", and indeed that was it.

After launching of the hull, the deckhouse and the drilling floor were placed on board by means of sheerlegs. Next the drilling derrick had to be assembled. It was supplied by Pyramid of Texas, USA, and was delivered at the yard as a kind of do-it-yourself kit. It contained a massive amount of galvanised beams and triangle plates, all neatly marked and provided with predrilled holes, together with bolts and nylock nuts. Mackenbach's able hands started to assemble the derrick off-site in sections of one vertical beam, but it then appeared that either the numbering of parts was incorrect or the pre-drilling of the holes was loosely done. Not a single hole was at the right spot and no two parts could be interconnected, whatever the yard's staff tried. After lengthy efforts to get somewhere it was decided that hopefully the numbering was correct and that the holes should be reamed or drilled at the right positions. It took weeks of obstruction of the jetty in front of the piping shop and a large number of manhours to assemble the darn derrick

The famous wine tanks mentioned above were delivered at the yard in a closed box. It was absolutely forbidden to open this box unauthorized, to avoid contamination of the ceramic coating of the tanks inside. The outside of the tank was painted in shop primer. After the tanks were unpacked, placed on board and mounted on their foundations, disaster struck. An fitter on job in the forecastle needed a spot to weld a lifting lug and the poor wretch chose a winetank as his foundation. This of course damaged the internal ceramic coating. When captain Petroni discovered this disaster, the ship and the yard were too small to escape from his anger. After much begging the tank manufacturer agreed to repair the damage, but we suspected that after this incident the French crew strongly preferred bottled wine.

During the fall of 1971 the interconnecting cables for the wheelhouse area were delivered to the yard. Alcatel sent a technician for the installation and interconnection work: Mr. Courtinel. With his big moustache he always looked sad, in particular when on 18 January 1972 the yard went on strike, until 25 February. He had a hell of a job to complete his work before the seatrials, which started in March.

While the outfitting of the accommodation deckhouse progressed, the large size of the DP control room immediately aft of the navigation bridge became visible. It was as large as the wheelhouse itself and was being stuffed with two digital computers, an analog system, control boxes of the acoustic position measurement system etcetera. The double floor of the wheelhouse deck was filled with the many interconnection cables between the thruster control desk in the wheelhouse, the computer room and the sensors at several locations on the ship. A separate air-conditioning unit in a separate room took care of cooling the electronic gear. And, after all, the dual PDP8 computers were baby toys in todays perception, based on 8 byte memory fields and a CPU which' activities one could follow by looking at the blinking green lamps. Nowadays (2016) the DP controllers are like notebook Only days before the sea trials, Captain Petroni asked for a vertical pipe to be welded on the

forecastle in front of the wheelhouse, as far forward as possible. Because the wheelhouse was up front, the navigation crew had no reference to see exactly into which direction they would be sailing. Normally the forecastle light mast serves for this purpose. The pipe was mounted and became a standard design feature of the Pelican series.

As usual, a measurement of the metacentric height of the ship was executed shortly before the seatrials. It appeared that the centre of gravity was above its calculated position. Therefore, after seatrials, permanent ballast was dumped in some double bottom tanks while the ship was at “De Nieuwe Waterweg” yard for miscellaneous work.

As mentioned above, the hull painting had been done in haste and under wet conditions. This showed up during the seatrials: as soon as the ship had passed Hoek van Holland and started to move at full power, sheets of coaltar epoxy sheared off the hull and floated away into the North Sea. After the trials the ship was docked; about half of the epoxy coating had disappeared and Pelican was semi-nude in shop primer. Ultimately after commissioning of drilling and diving systems in Marseille in January 1973 the complete hull has been grit-blasted and repainted,.

In winter 1973, Pelican returned to Rotterdam for her guarantee docking at the Wilton Feyenoord yard. All propellers and thrusters were opened to replace the pitch feedback mechanism, which suffered from excessive wear. The problem had been discovered during the second yard trial trip in July 1972 and at that time had already resulted in two dockings for repair at Wilton. Now, in 1973, the replacement had to happen during extremely cold weather, with icing of the thruster tunnels.

Neither Gusto nor KaMeWa were very happy with this apparent underdesign. KaMeWa was only prepared to supply a new and better mechanism, and Gusto had to pay for all the docking and manhour costs. Gusto had already changed from KaMeWa to Lips in ordering the thrusters for Havdrill and subsequently to this incident ordered the thrusters for the following ships (including those built abroad) also with Lips, who ultimately delivered 35 CP propellers for the Pelican class vessels.

Sea Trials and Delivery

The first sea trials of Pelican took place on the southern North Sea, from 22 to 24 March 1972. A serious morning fog prevented departure at the planned early hour, but soon the sun broke through. The trials included the conventional demonstration of things like the service speed of the ship, plus a 24 hours test of the endurance of the thrusters. Tests of the Dynamic Positioning system were not possible because of the shallow water depth of the sea offshore IJmuiden, but such tests were foreseen for a later time in Stavanger fjord. As a matter of fact, the yard had declined the responsibility for Somaser’s choice of Alcatel and therefore the DP trials were not in the yard’s supplies.

During the 24 hours thruster endurance tests, the thrusters were sometimes run port=starboard=port and so on through manual control. At other times they were running for a longer time in one direction, making the ship rotate 360° around the derrick on and on.

Some worried fishermen reported to Radio Scheveningen that a ship on the North Sea had gone crazy.

Back in the yard, completion continued. On March 27, de Secretary of State mr. RJH Kruisinga paid a visit to Pelican. The rumours about a special project had apparently reached The Hague. In May 1972 docking at WF took place in preparation of the hand-over to the owner, which took place at Gusto on 16 June 1972. Thereafter Pelican again departed for North Sea for drilling system tests. After that, the ship sailed to Norway for testing and commissioning of the DP system in deep water of Stavangerfjord. The yard had permission to bring a small crew on board to validate the models which were used in the DP development. Bert Hageman, Bram Brink, Rein van Wijk and George Lagers flew to Stavanger and boarded. A week or so later they returned empty-handed, because Alcatel had not yet succeeded in starting-up the system. They claimed that there might be a standing wave in the fjord, which caused sway instability of the ship. The instability however was in their own system.

After Delivery

Finally Alcatel made it work and Pelican shifted to Marseille for further work on drilling and diving systems. Somaser had complaints about the functioning of the Unicode and therefore Mr. de Fremery, the yards hydraulics expert, and George Lagers flew to Marseille to discuss the matter. It appeared that the hydraulic oil contained some contamination, probably caused by inadequate filtering when the system was filled.

Ultimately in spring 1973 CFP accepted the Pelican. Her first mission was in Canada, offshore Labrador, in summer 1973. In October 1973 she sailed from St. John, Newfoundland, to Luanda, Angola. Within 1973, Pelican transferred from Marseille to Labrador and then to Angola, at an average speed of about 13 knots, proving the mobility of the concept.

Operation

The first captain of Pelican, Captain Pourtau, had to face some serious problems which are listed hereafter :

Crew size

Pelican was built and equipped (life saving) for 90 persons , but this was not enough. Foramer had to organize to operate the ship and drilling systems with a minimum number of people but get permission to exceed the 90 people allowed according to the ship certificates. This involved the provision of additional life saving equipment.

Possible large roll angles when drilling

All people involved were very concerned by the possibility of the roll natural period getting close to the seastate period, resulting in large roll angles not suitable for drilling operations. A very low GM value (very long natural period of roll) could also result in large roll angles caused by thruster activity .

In order to reduce the roll, a large free surface tank was provided forward of drillpipe hold. The effect of this tank was to dampen roll and to reduce the GM value, but as Pelican was built with a very low GM value, this tank has never been used and was not provided on later Pelican type vessels.

Over- estimation of GM value :

As indicated above , the GM value was a great concern at the early design stage and in order to be sure that the final GM value should not exceed a certain value , two ballast tanks (1000 m3 each) named « Detuning Tanks » were provided, one on the top of the accommodation, one under the helicopter deck . Those detuning tanks were never used and were later converted. As already mentioned above, the centre of gravity after construction appeared to be higher above keel than estimated in the design phase, so the GM value was low to very low.

While loading the unit prior to going at sea , the handling of loads by the crane resulted in a permanent list of 10° to 15° causing :

-Great fear and concern of people on board , fortunately nobody was injured

-Rupture of the ropes tying the Pelican to the quay , fortunately a couple of tugs passing by could bring the unit back in place .

When sailing to open sea it was discovered that the unit had a small permanent list which could shift from one side to the other , this shift being caused by stiff rudder changes : obviously Pelican had a slightly negative GM value .

As a consequence the Free Surface Tank and Detuning Tanks have never been used and their drain valves were kept open to be sure that no water could stay there .

The stability during the first campaign in North Sea (1972) was maintained by the load distribution on board and minimum required fuel in the tanks .

In 1973 an inclination test was done and resulted in 900 t of cement installed in one of the fuel tanks forward of the moon pool .

During Pelican's lifetime, the rolling angle has never been a problem whereas stability and actual payload proved to impose limitations to the drilling operations .

When Pelican was converted to 1000 m water depth capacity, it was equipped with blisters increasing the beam by approx 4,0 m.

Navigation, sea keeping capability, storm

Sea keeping and station keeping were very good although the unit was a bit underpowered and steering by one single rudder located in between two propellers was not optimal .

The first storm was encountered on the way back from North Sea end 1972 :

-Because of the heavy wind at the bow , the speed went down to the point where the rudder could not maintain the ships heading and wind incidence moved from bow to beam resulting in 20° list, frightening. The crew had to steer with the thrusters to come back to an acceptable situation .

-Aside of Pelican were small ships which could not proceed forward but could maintain their heading

During the 1974 campaign off Canada the starboard propeller was lost, sheared by a growler[7]. The insurers allowed us to continue with only one propeller .

On the way back to Europe , fortunately the wind was from starboard. Due to the missing propeller, the ship had a tendency to turn to starboard. The wind tended to turn the ship such that the wind was head on. This went fine until the Mediterranean Sea was reached where the wind became weak and from portside. Steering then had to be done by the thrusters.

During the 1975 campaign off Newfoundland (well Cartier) in a water depth of 320 m (quite close to the design limit of the unit), while retrieving the BOP at approximately 50 m under the hull, the operation had to be stopped because the wind had grown to 70 to 90 knots. The wave height was 14 to 16 m with a few records at 21 m , after that the Datawell wave rider buoy died. Under these conditions the heading was controlled by the thrusters. There was heavy pitch as the waves were very steep.

At the end of the bad weather, the BOP was brought back on board and it appeared that the riser in way of the bottom of the moon pool was sheared. Only the kill and choke lines were holding the BOP .

Based on the above , Captain Pourtau was very confident that the sea keeping capability of the Pelican was OK. But what would happen in case of black out or non availability of the power?

Ice & icebergs

The Pelican was ordered specifically for drilling operations offshore East Canada and Newfoundland. In view of this mission, the intended Operating Sequence was :

- Capacity to carry the full complement of consumables for two wells
- Depart from Europe in order to reach East Canada by mid July , just when the area of operation starts to be free from ice .
- Drill two wells in areas with ice, growlers and icebergs. The drilling and mooring systems were to allow for a quick disconnect from the seabed and drift away in case of a potential iceberg threat. This implied :
    - A quick disconnection system in the subsea equipment in order to get free from seabed ;

[7] Growler = ice floe, small iceberg.

- Dynamic positioning in order to swiftly adjust the position
- Ice class

- Depart from East Canada by mid October when the ice is back .

During the operations offshore Labrador from 1973 to 1975 lots of ice and icebergs have been seen, specially in 1974. The area of operation was full of ice packs, growlers, icebergs and :

-The crew had to adjust the heading of the vessel in order to protect the taut wires (located on starboard side) from possible contact with the ice ;

-A special company (Marex) was on board keeping a 24h watch on radars to detect icebergs , plot their position, speed and direction to confirm whether or not they might become a threat to the operations .

-Those for which speed /direction were identified as a possible threat to the operations were towed by the stand-by supply vessel. It was considered that 1HP of propulsion was required for 100t of iceberg .The supply vessel was equipped with a floating hawser and a buoy to get it around the icebergs in order to tow it away .

-When the situation was potentially dangerous , drilling operations were put in stand-by in order for the unit to be ready to disconnect from seabed; of course the operations which were not compatible with a fast disconnection (e.g. running Drill Collars) were considered only when the situation was safe .

In 1974 , more than 300 icebergs have been identified, most of them were not a problem for the vessel's operations. Pelican had to be disconnected and move off approximately 10 times.

On 20 July 1974 the port main propeller was sheared off (probably by a growler) and lost but as mentioned above, the insurers allowed Somaser to continue operations .

As a conclusion , after years of operations offshore East Canada and Newfoundland , the Pelican was very well fit for the proposed sequence of operations in the exotic environment presented above .

In total, Pelican stayed offshore Labrador during 554 days in the drilling seasons of 1973, 1974 and 1975. Waiting on weather amounted to 6.5% of time, which is low for a ship-shaped floater. The DP system kept the ship within 3% of water depth during 93% of time; the maximum offset before disconnection becomes necessary is 6%. Emergency disconnections have not been made: all disconnections were prescheduled and due to either iceberg vicinity or excessive weather occurrences.

Follow-up orders

The successful design of the Pelican resulted in 4 repeat orders for the Gusto yard, but also some seven vessels of this class have been built under license at other yards. Drilling and maximum water depth capabilities were increased over time. The Pelican class drilling vessel became a household name in the Oil & Gas industry and was the basis for further DP drillship developments by GustoMSC. After more than 40 years, 10 out of a total of 12 vessels of this class are still in operation. The Gusto Product Development Department started the preliminary design of a ship for 3000 m water depth, code name Deepy. When in 1978 the Gusto yard was closed, this project disappeared into the archives.

From 1973 to 1983, Pelican and her sisters have drilled many wells offshore Newfoundland and Labrador :

- Pelican 11
- Havdrill 2
- Pétrel 4
- Pélerin 4
- Ben Ocean Lancer 1
- Pacnorse I 2

The Sedco 445 has drilled one well in that area, in 1975.

THE SISTERS

HAVDRILL, CO 907

Around the time of launching Pelican, in August 1971, an order for a second vessel was signed, Havdrill, basically identical to Pelican but with quite a few changes in equipment suppliers, including the drill pipe racking system, propellers and thrusters (Lips) and the DP system(Honeywell). The detuning tanks were omitted. Also the classification society was changed to DNV instead of Bureau Veritas. Havdrill was ordered by Nordic Offshore Drilling (Oslo), in which P.M. Meyer was the major partner and in which IHC participated initially. This participation helped to convince Meyer, but was never intended to last long.

On behalf of Meyer, Sven Wille was the owners representative at the yard. The Meyer building team was headed by Captain Lauritz Sund.

The specifications of Havdrill were identical to those of Pelican except that the operating water depth was increased to 400 m, the thruster power was set at 1750 HP (without change of diameter) and the voltage rating of the main generators was increased to 6kV.

The keel of Havdrill was laid on 1 May 1972. The christening by Mrs. Inger Malterud and the launching of the hull took place on 17 February 1973 and was followed by a dinner party at the Amstel hotel in Amsterdam.

During launching a small incident went by unobserved by guests and officials. It was common practice for the yard whilst the vessel laid on the slipway to drill small drainholes in the tanktop such that rain would not form pools of stagnant water. Shortly before launching these holes were to be closed by welding, but due to dirt it was sometimes difficult to find them. Therefore some people stayed on board during the launch with the task to check the bottom of the ship for leaks. And indeed, in the engine room a fountain of 5 m high was discovered after the hull entered the water. One of the foremen was quite prepared for this and carried wood plugs with him. He quickly hammered a plug in the hole but in the process got soaking wet off course. Later in drydock the plug was removed and the hole permanently closed.

On the second of April 1973 a severe storm warning was issued in the afternoon. Havdrill was moored at the completion quay with steel wires fore and aft and some spring lines. At that point in time, the deckhouse, the drilling deck and the helideck were installed already, so the ship had a substantial profile exposed to wind. Peter Mackenbach decided to add some extra mooring lines and by 5 o'clock still more. By the end of the day, the north-westerly gale had grown to windspeeds of 170 km/hour, Beaufort 13. While a small team of workers was still busy doubling up the mooring, the ship started to move slightly, then more. It was clearly unsafe to keep working at the spot, which was quickly evacuated. And indeed, with loud bangs and deadly force the mooring lines snapped one by one and the ship slowly started to drift away across the river, its bow pointing east steadily, towards the quay of our

competitor RDM. Tug assistance was quickly called in, but the tug masters considered the situation too tricky to make fast.

Softly the Havdrill touched a tanker moored at RDM and then started to drift slowly to the east, into the direction of the RDM harbor. Her helideck touched the accommodation deckhouse of the tanker, damaging both. Havdrill was blown slowly foreward into the harbor, slightly touching the stern of a sealed gastanker in a floating dock, and finally stopped by pushing her bow into the east quay of the harbor, her side against a large duckdalf. On the quay was an elevated track with some small cranes on it. This track was slowly but certainly pushed over and ended up as scrap iron. Insurance has taken care of the repair costs claimed by RDM for this, but the repair has never been executed, because the track was planned to be demolished anyway.

Peter Mackenbach and his people drove to RDM on the south bank of the river, to inspect the damage and first of all to see the people on board who unwillingly had made the trip. The head of Final Assembly, Wim Paardekooper, arrived on the scene and made a settlement with Piet Koudstaal, acting manager at RDM, for damage and mooring fees. The next morning, when the storm was over, the Havdrill was towed to the repairyard “De Nieuwe Waterweg” for an inspection docking. Damage appeared to be minor. And this docking provided the opportunity to close the drainhole mentioned above.

After this incident the completion activities were resumed without any major disturbance. After completion, the seatrials were performed in October 1973. All seatrials, including the DP commissioning, were the yard’s responsibility this time. After the standard trials the Havdrill sailed to Stavanger for the DP tests in the minimum waterdepth for DP, 60 m, which is not to be found in the southern part of the North Sea. In Stavanger fjord the acoustic beacons mounted on a temporary structure were lowered to the seabed on a steel wire with a buoy on top. The trial captain was afraid that the steel wire might get entangled in one of the propellers and therefore it was replaced by a long rope so that the buoy could stand off the ship. The handling difficulties resulted in the loss of two beacons and the ship had to enter Stavanger harbor and pick up two new ones, which were flown in from Schiedam. Also these were lost after a while but recovered by a diver, although the water depth (60 m) was officially too deep for diving with compressed air, which is normally not done over 50 m of water depth. After refusing at first the Comex team leader finally agreed to give it a shot and his divers succeeded so the trials could be continued.

Also with Honeywell, the start up of the DP system was not without problems. At one point in time, data overflow in the computer memory caused the system to run out of control. At another instant all thrusters suddenly ran to full power, causing a large heel of the ship, scaring people and shifting all loose material on board with tremendous speed to the starboard side. But ultimately all worked well and the system was accepted.

Back in Schiedam, the official transfer of ownership took place in the yard of Wilton Feyenoord, early November 1973.

Havdrill was initially operated by Foramer for drilling and P. Mayer for marine activities and was contracted to British Petroleum. In 1976 Havdrill was sold to Canadian Marine Drilling and renamed Canmar Explorer III.

In March 1974, a young Foramer engineer, Olivier de Bonnafos, was offered a stay of two weeks on board Havdrill, operating on St George Channel in between Wales and Ireland. This would provide him with operating experience for his job during the building of the next ship: Pétrel.

De Bonnafos joined the crew change helicopter in Swansea and had a very rough trip on board as the weather was pretty bad. Havdrill was on location, Waiting on Weather, as the heave exceeded the limits of operation . During the two weeks on board Lucien Giraud ,the Foramer Site Manager, took him everywhere on board and explained how things were working or not working on this very new drillship :

March in St George Channel : swell resulted in the heave motion exceeding the limits of drilling operations most of the time. Therefore he could not see much drilling but could see how heave compensation was operating. The riser was connected and drillpipes were in the well all the time. The Havdrill was keeping steady on location , the power supply and propellers were no problem but the acoustic position system (Honeywell) was not properly working and the Havdrill was positioned on taut wires .

In 2007 the ship was again widened from 23.78 to 29.75 m at Sembawang Shipyard in Singapore, in order to be fit for drilling in 1500 m water depth. Further modifications at that time were:

- New drilling derrick and drilling equipment
- New solids removal plant
- Overhaul of marine systems
- Rebuilding of accommodation spaces
- Renewal of riser storage racks, riser gantry and pipe handling cranes

Jaspar Explorer, former Havdrill

PÉTREL, CO 947

After his training on board of Havdrill, Olivier de Bonnafos clearly was the engineer to team up with the Gusto staff for the next project: Pétrel, ordered as a copy of Havdrill, contracted to Elf, to be operated by Foramer for drilling and by Fina Marine on the marine side. The owner of Pétrel was the newly formed company Offshore Europe NV, with Ackermans & van Haaren, Foramer and Petrofina as equal shareholders. The ship was to operate under Belgian flag. A building contract in the amount of Dfl 140 million was signed in April 1974. The owners representative at the yard during design and construction was Mr. Bogaert, a friendly gentleman who took a very reasonable approach to additional prices offered by the yard for the miscellaneous design changes. There have been many changes, requested by Elf, which had to be implemented "on the run". Fortunately there was a lot of trust between Elf and Foramer on one hand, and Foramer/Offshore Europe and the Gusto staff on the other hand.

"Copy of Havdrill" should not be taken too literally. Like Havdrill, the Pétrel had no detuning tanks, but unlike Havdrill the DP system was ordered with Alcatel. The confidence of Gusto in the performance of Alcatel improved over time, to a large extent thanks to the Alcatel systems engineer, Mr. Di Giacomo.

The water depth capacity was increased to 600 m. This increase in water depth rating opened up a vast area of the continental shelves worldwide. De Bonnafos mentions that Pétrel was built with some 900 to 1000 tonnes of permanent barite ballast in a double bottom tank and that the amount of fuel in the double bottom should never be less than 1000 tonnes, all in view of static stability of the ship.

The major modifications required by Elf to the increase of water depth were :

Subsea Systems :

- Change of the two subsea BOP Stacks for a single one 16 ¾"-4 rams -10 000 psi.
- Change of the double riser system for a single 18 5/8" with buoyancy modules to minimize the required tension .
- Increase Riser Tension to support the new riser and increased length.
  This was very critical. Due to the increased height of the BOP, it could not be handled under the drillfloor. The drillfloor height could not be raised because of the limited static stability of the ship. The only possible way to solve the problem was to split the BOP in two parts and run the top part through the drillfloor high enough to pass the bottom part underneath.
- The added difficulty to undertake the modifications required above was that the Cameron 16 ¾" , 4 rams 10 K Subsea Bop had never been built before and nobody was able to confirm the dimensions of the bottom and top part .
- The design of the Substructure-Drillfloor could not be delayed, so in order to be able to progress, De Bonnafos and an engineer from Gusto in charge of the substructure went to Cameron in Houston and let them know the possible

dimensions of the opening in the drillfloor and the clear height under the substructure and asked them to configure and build the BOP accordingly , which they did .

Riser storage and handling :

- In order to be able to store and handle the new 21" riser, a complete redesign of the aft deck was required, again in a rush in order not to delay the overall design of the Pétrel.
- Heave compensation : change of the original Gusto heave compensator installed at the top of the derrick by a Vetco , single jack travelling block compensator. This required the redesign of the derrick, a big job for Foramer.
- Riser Tension : based on Gusto design , the number of tensioners was upgraded to meet the increased water depth.

Dynamic Positioning System :

- Because the Honeywell acoustic position measurement system on Havdrill was not working in accordance to expectations, the decision was taken to go back to Alcatel. Alcatel offered a new system, upgraded from the original Pelican equipment .
- The installation on board was new and required several modifications of the cable routing, developed while Gusto was designing the ship .

Construction

The keel was laid on October 24, 1974 and launching of the hull took place on September 6, 1975. The naming ceremony was performed by Mrs. Didier, spouse of the managing director of ELF, Mr. François Didier. The launching was celebrated in the castle of Loevestein, where a grand dinner-dancing party was held, with gipsy music by Gregor Serban. All guests were welcomed at the castle gate by a clarion call. Three days after launching, the deckhouse weighing 350 tonnes was placed on the forecastle by the floating sheerlegs *Ir. Snip* en *Taklift II.* This section of 22 x 18 x 12.5 m was built at the Gusto Slikkerveer yard.

Sea Trials and Delivery

On the second day of February 1976, Pétrel left Schiedam for seatrials. After the traditional test such as the speed tests, a crash stop, a turning test, the ship set course to Bergen, Norway for a rather extensive testing program related to subsea equipment and dynamic positioning. The idea was to perform these tests in Sogne fjord, like had been done with Havdrill. A large complement was on board for the extensive testing and commissioning programs plus a marine crew, altogether some 150 men. To accommodate all these men, bunks had been borrowed at the Red Cross in Schiedam and all 2 person cabins were temporarily transformed into 3 bed cabins.

The weather underway was rough and cold**.** A good solid 50 Kn East wind was blowing, visibility was poor due to snow showers and Pétrel (fairly light) was listing and rolling up to 11°. Much rougher and colder was a message received while underway, that no permission for testing in Norway was granted. This permission had been applied for since long, but even two weeks before the planned trials, no answer had been received. Hein de Rooij had tried to expedite the answer, but only got a reaction in the style of “we are working on the case”. In view of the good contacts in Norway, the yard had decided to go ahead and sent a substantial number of boxes with equipment and tools to Bergen. And then the verdict arrived: no permission for the tests.

Within a very short time, a new location was found in the delta of the Firth of Clyde and approval of the Scottish Authorities was obtained. So Pétrel changed course, sailed along the north coast of Scotland and went to Greenock harbour to pick up the cargo, which was air freighted from Bergen. Next, the ship proceeded to the designated test area near Aran Island. The weather remained cold, with snow and 30 knots winds and associated swells.

Although we were pretty close to Aran Island , our connection to the shore was limited to the a small boat used to dispatch post to the various islands , this could only reach the Pétrel in the short milder periods. Hein de Rooij was our liaison man on shore, in a hotel in Kilwinning. All transport from Holland to the ship was arranged by him personally driving up and down to the airport (a trip of 1½ hour one way) and dispatching into a boat at a jetty in Ardrossan. So, when Hans Sjouke let him know, that he would fly in and would visit Pétrel, de Rooij planned on this same routine, albeit with a small cruiser to reduce the sailing time from 2 to 1 hour. About 15 minutes driving away from the Glasgow airport, Sjouke asked how much time the trip would take. When he realized, that this was 3½ hours, he said: turn around immediately, get me back to the airport and let me know once you have arranged faster transportation, which gives me more than just one or two hours on board. And back to Holland he went. Two days later, Sjouke was immortalized by the yards photographer Paardekam, while stepping out of a decent size helicopter.

The Alcatel people started their commissioning work in spite of seasickness and the unpleasant weather conditions on deck. Di Giacomo worked around the clock, with support of some 4 other Alcatel staff. Kees Willems and George Lagers followed a 12/12 hours schedule to monitor and support the DP team. The usual problems occurred: black-out, drive-off, etcetera. An unusual problem was presented by the cook, who got appendicitis and had to be evacuated to the nearest hospital for surgery. For a couple of days we had no cook and had to survive with cold food and coffee until a new cook was mobilized on board .

After nearly two weeks Alcatel had demonstrated the required positioning abilities in intact condition and had been able to test most of emergency and damaged cases to the satisfaction of Gusto, Elf, Foramer and also Det Norske Veritas although their knowledge in DP was very limited .

In conclusion of the trials, Pétrel was to enter the small port of Greenock near Glasgow, Scotland. The port was rather narrow, but had a very wide entrance parallel to its length.

Two tugs were rushing towards us, to assist in the mooring operation, which was indeed impossible for a conventional ship without tug assistance. Our pilot, however, had observed how the captain and mates handled the joystick on the bridge to move the ship in any direction and decided to dismiss the tugs, much to their surprise and dismay. They remained stand-by, waiting for disaster to come and require their help after all. The pilot manoeuvred the ship in front of the dock entrance, then moved it sideways into the dock and finally moored up softly along the quay. You should have seen the faces of the tug crews: they had seen water burning.

After subcontractors, including Alcatel, had left, Pétrel sailed back to Schiedam around the south coast of England. Many people on board used the trip to sleep and sleep and sleep, after the intensive trial period. Back at the yard on 19 February, the installation of drilling systems was resumed until the ship was ready for delivery except for the demonstration of proper dynamic positioning in the contract water depth of 600 m. Sogne fjord was not even tried; the Golfe de Gascogne was selected as the test area. So, after the first formal hand-over at the yard on March 21, 1976, Pétrel (with DP specialist Kees Willems on board) sailed south to the Gulf of Biscaye, where JD Bax and George Lagers went on board after a very rough ride in a small fishing boat starting from St. Jean de Luz. Actually, halfway between the port of St.Jean and Pétrel, our fisherman wanted to return to safety because of the bad weather. A bundle of dollars convinced him to continue. The next day the weather improved somewhat and testing started. At one point in time, while positioning in 700 m of water depth, something went wrong and we started drifting off. Our only connection with the seabed was the taut wire position reference system and Lagers did not like at all to have to lift the taut wire deadweight off the seabed because of the subsequent time loss to get things back in place. So for 2, maybe 3 minutes he tried to hold the ship by manual control, looking at the taut wire signals. First the owner's DP operator looked at him in surprise, then began laughing. He was right, of course: this was something you had to leave to a computer. A few days later, at the end of April 1976, after all tests had passed successfully, the ship was delivered to the owner at full sea and the small Gusto crew left with the same fishing boat, over smooth sun-lit water.

Acergy Falcon, cable l& pipe ayer, former Pétrel

PÉLERIN, CO949

POLLY BRISTOL, CO950

A few month after the decision of Elf to contract a drillship , Total decided to contract a second drillship, to be named Pélerin and as Total intended to do better than Elf, it was decided to give Pélerin a waterdepth capability of 1200 m and a beam of 23.45 m. Total got the Norwegian shipowner Helmer Staubo involved, who placed an order for the ship in May 1974. Very soon thereafter, a second ship was ordered by Staubo, this time on speculation.

Once again, ordering a copy did not mean an exact copy. Helmer Salvesen, on behalf of the ship owner, discussed Staubo's and Total's particular wishes with the staff of the Gusto drawing office. The result was a long list of items, based on which Gusto had to make up its mind whether or not the changes could be made. It became known as the "yes and no list" and caused nightmares for the sales director, J.D. Bax, because Salvesen considered every item marked "yes" as an accepted modification at zero additional price.

The increase in beam meant that the hull would be too wide for launching from the westerly slipway of the Gusto yard. The keel laying, however, could not wait for the launching of Pétrel from the easterly slipway. Therefore it was decided to start building on the west slipway and skid over the partially assembled hull as soon as the east slipway would be available. Of course the classification society, Bureau Veritas, was involved and it instructed Gusto to only start the skidding when BV staff was present. But the evening before the planned skidding, Leo van Putten wanted to test whether or not the hydraulic rams for skidding delivered sufficient force. The partial ship's hull started to move at a lower pressure than expected, and on the spot the yard crew decided to go on. BV, next morning, was not amused. On 27 March 1976 the hull was baptized by Mrs. Pierre Germes and safely launched from the east slipway.

Aban Abraham (former Pélerin)

The increase in water depth capacity involved upgrading of the Unicode crownblock heave compensator and the riser tensioners. The

length of part of the riser joints was increased to 80 feet. The DP system was again ordered with Alcatel. Pélerin left the yard for seatrials on the 16th of August, 1976. Its delivery to Staubo took place late October.

In 2006, Pélerin, which was by that time named Peregrine III, was converted and renamed Aban Abraham. Amongst other modifications, it was equipped with blisters (see photo) increasing the beam to 27 m, a new derrick and a helideck forward.

The last ship started at the Gusto yard was the CO 950. On 10 May 1976, the order was cancelled by Staubo because of financing and marketing difficulties; the ship had been ordered on speculation. IHC received an appropriate cancellation fee and decided to continue the construction for its own account, expecting that in due time another party would turn up to buy the vessel. Before it was launched, the curtain fell for the Gusto yard: within the IHC group the shipbuilding capacity would be reduced by closing the old facilities of IHC Gusto. The CO 950 was launched in July 1978 and towed to Boele Bolnes for completion and outfitting. Its first name was Polly Bristol.

Noble Leo Segerius (former Polly Bristol)

Paragon DPDS2 (former Polly Bristol)

SHIPS BUILT AT OTHER YARDS

Further ships of the same design were built under license in Scotland, Norway, Finland and India and more competitors appeared on the DP systems market, most notably Kongsberg. Water depth for operations was soon increased from 320 to 1000 m, the DP power was slightly raised and the load carrying capacity was increased by a larger beam of the vessel in newbuilts and by adding sponsoons to vessels already built.

After the Valentin Shashin, Viktor Muravlenko and Mikhail Mirchink were built in Finland on behalf of Russia, the market virtually went dead for a number of years. In the 1990's a revival occurred, but then the market was ready for larger ships operating in deeper water. The Pelican design still served as a reference but new designs were offered by both Gusto Engineering and its competitors.

Mikhail Mirchink, now Peregrine 1

Valentin Shashin, now Deep Venture

Sagar Vijay

Photo's to be found in Maritime Connector or www.shipspotting.com/gallery