Hovercraft to the rescue



Pict 1: Evacuees arrive with the hovercraft from the flooded area (Photo ANP 1993)

1: Prelude to the floods

Amongst several other things Holland if famous for being a country which is situated for 40 % below sea level. An integral water management system of canal, locks and pumps allows the existence of major parts of Amsterdam, The Hague and other major cities. This situation caries an inherent risk for the area's in the coastal region positioned below sea level.

In 1952 Holland was struck by a major flood. The February flood killed hundreds of people and left thousands homeless. This event was the start of the Delta Program, a program which covered 30 years of innovation in the field of marine civil engineering. The first phase of the program ,costing billions of dollars, was aimed at first line protection of the coastal region, the second phase at the river area towards the east of the country.
By the end of the 1980's all major projects in the coastal region were finished, leaving the upstream region of the big rivers, Rhine, Meuse, Waal, Lek and IJssel

only partially covered. Here the programs were delayed by trying to find a balance between the authenticity of the countryside an 7 m high reinforced dikes.

Flooding in this region was not common as the rivers are seasonal natural rivers with a summer and winter bed wide enough to carry the full flow of the river. And despite all the programs government agencies have been training and testing different scenario's for emergency situations since the 1952 flood.

A central government agency is responsible for everything involving water management. This agency, rijkswaterstaat, is constantly monitoring the flow of the rivers, the condition of the dikes, canals, rivers etc. They are responsible for putting out high water warnings, as they had to do in both disaster years 1993 and 1995.

2: The local situation for the river area

The big rivers like Rhine and Meuse are rain and snow rivers having a summer and winter bed. But in the late 70's and early 80's project developers started to develop housing projects in the winterbed of the rivers. By the 90's people we living in area's were the river used to be flowing with the river partially diverted by canals. More and more land was claimed in the winterbed leaving the river marginal more then the summerbed.

In addition to the Dutch programs, the upper region of the Muese in Belgium was made straighter and deeper to enable more transport by barges. This causes a rapid draining of the high area of the Ardennes leaving the water no time to drain into the bottom putting an additional strain the capacity of the river.

3: Disaster strikes

Both in 1993 and 1995 unusually heavy rain fell in Northern France, Belgium and Holland in December (1993) and February (1995). In 1995 this was the case as well in Germany.

The first time, in 1993, first the water level of the river Meuse started to rise to what finally would be 2 m above average. The river was flowing a rate of 6 - 8 knots. This caused rapid erosion of the river bed

In 1995 this was combined with long term high water levels which had saturated the dikes main structure changing a dike into a flexible barrier of mud. In both years dikes started to collapse flooding the original winter bed were now thousands of people were living. As there was no other way for the water to go the water level was pushed to the extreme, flooding area's which normally never would or could be flooded.



Pict 2: Part of the operational area 1993 / 1995, flooded villages on both banks of the river (De Limburger 1993)

In 1993 we found ourselves driving to work and listening to radio being warned for high water levels. We, were a group of people who worked for Hovertrans.

4: Hovertrans

In 1993 Hovertrans had been involved for 4 years in the design and development of ACV's. December 1993 1 demonstrator craft of the Colibri type was lying in the harbour, and one craft was in the workshop being finished for a customer in Indonesia. Operational experience was gained during the years by doing test runs, doing projects for government agencies and by training and working with more experienced hovercraft people. During the Floods The craft known as "Tuchone Princess" was at the factory were it was used as a demonstrator. The craft was equipped with the 6 cyl. Deutz engine and capable of carrying 18 persons or 1500 kg of payload.

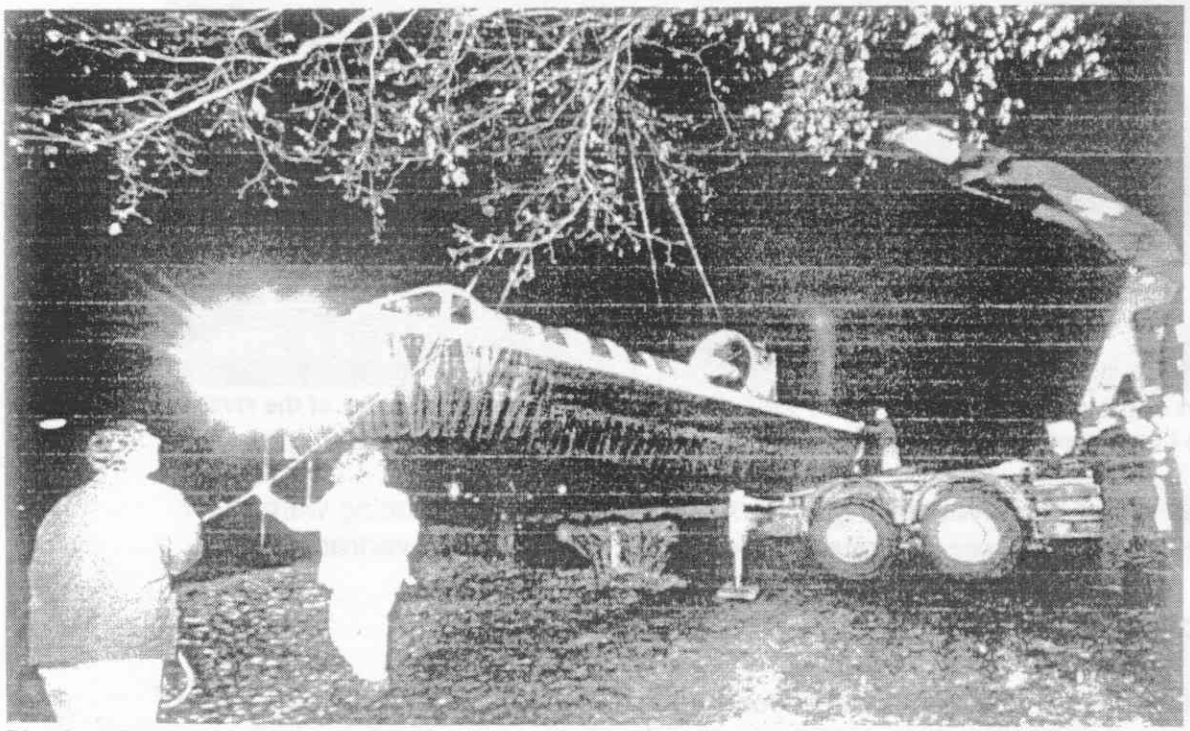
5: Preparations for the emergency situation

On forehand we had never prepared for the if and when an emergency situation would arise. And we certainly not expected it to arise on our doorstep. One Tuesday morning in December 1993 when we were having our coffee we were discussion the high water level warning which had just been on the radio. We decided to contact

the local authorities in the flood danger area if they would like some assistance. After some internal discussions they said yes. We consequently needed clearance from our mother company and from the insurance. By noon every party involved had given permission, and we were loading a craft with all the material we thought we needed.
None of the parties were knew on forehand what they were getting into.

6: Departure and problems getting on - site

We could get the craft on location by truck or by flying her upstream. All shipping had already been banned by then from the rivers as they were already running at a high rate. Waves would increase the loads on the dikes. As the operation of the craft is not hampered by high flow rates, and nor does it generate waves, we got clearance to fly up stream to the endangered area.



Pict 3: " Tuchone Princess" is unload in the middle of the night from a flat bed truck. (De Limburger 1993)

Refuelling stations along the route were informed so the craft could take in fuel. A crew of 2 manned the craft, And a crew of 2 followed by car.
When it got dark the on board crew got into problems as the found them selves in a huge flooded area with no navigational points to focus on.

After short radio contact it was decided to birth the craft is the nearest town and ship the craft from there on a flat bed truck, as is, under police escort.
Berthing the craft was no problem as the rivers were already running over the keywall.

The craft arrived in the most endangered zone shortly after midnight.

7: Operational Problems:

No specific task was available for the craft as nobody on the crises team really knew what the craft could do. We decided to make a testrun to one of the flooded villages. As we had no maps of the area we pretty quick got lost in area in the dark. The craft had just its radar to navigate on and although we could seethe houses on the radar, we couldn't get near to them as we got stuck on what used to be the local soccer field.
A combination of heavy rain, and the darkness forced us to find our way back under near to zero visibility.

We turned back, but our original berthing place turned out to be full with fire trucks. At that time no communication link could be established so we had to go in blind. Whilst going in ¾ of the rearskirt was ripped by a piece of barbed wire just 4 inches above the still rising water level. Hence the craft got stuck, and we had to wait for daylight to do the repairs.
Bringing in spares from the workshop a combination of washers and poprivits made the craft operational again before noon that day.

8: The turning point

It was decided to take a different approach. In co-operation with the fire department, who were in command, a number of measurements were taken:

- The craft was going to operate from the river side of the villages were there were less obstacles.
- A clear communication link was formed, directly to the fire department.
- 1 person stayed at the crises management centre to advise on craft operations
- A berthing place of the craft was chosen with short connections to public emergency services.
- The berthing place was cleared of all obstacles which could hamper the craft.

By taking these measurement we were able to maintain a support service with the craft for 2 flooded villages.

9: Task force

This "newly" formed Task force (Hovertrans - Fire department) proved to be a success. Evacuating people, running supplies, and even rescueing people who tried to go out on the river with low power boats. The operation operated flawless for 72 hours.

After the first flood several evaluations followed on which both the civil authorities as well as the military authorities for the region took part. Every party judged the hovercraft as one of the most effective services which were operational.

Hovertrans equipped Princess with an additional search light.

10: 1995 (seccond time arround)

Just a year and 2 months later a situation occurred worst then in 1993. Water levels became critical for larger pasts of the country. His time we came more prepared.

The craft was on location and operational within 24 hours after the initial warning. Transport was arranged using a flat bed truck equipped with a hydraulic crane to launch the craft. Sidebodies were folded down and within the hour after arrival the craft was operational.

During the crises the craft was operational for 4 * 24 hours during the crises forming the only link between the world for 2 villages completely flooded.

The team evacuated most people when they had to evacuated after a state of emergency had been declared. It turned out to be possible to take out 600 people in just 4 hours. The total operational time for the area was identical to that of 1993 but only 15 % of the total amount of spares and repairs was required.

1995 We had just developed a smaller craft known as Hurricane, This craft was capable of carrying 5 persons and was powered by a 100 hp petrol engine. We contemplated making the prototype craft operational. I made a testrun on the river and found the craft not having any problems with the currents, but with the operational temperatures. Try moving people and supplies in an open craft at + 5oC, and try keeping everything dry and warm. This turned out to be not a practical solution. Moreover we didn't want to risk an experimental craft.

11: Operational Evaluation

For these kind of emenrgency operations in a semi-urban area a slightly smaller craft is more preferable, but small craft like 3 - 4 seater
open hovercraft are useless.

A craft has to be fitted with a closed cabin. We transported people who had previously been transported by Ridged inflatable. They preferred to wait for the hovercraft.

Popular image is a stretcher being carried by a 3 or 5 seater craft across the craft. You would not just like to carry the stretcher but also some medical equipment, and when possible ambulance staff.
Keeping people dry is very important. A craft is operated using 2 people. One person is required to assist the pilot during difficult manoeuvres.

The staff managing the crises has to know what to expect from a craft. That why its better to have an experienced person assisting them in planning the operations.



Pict 4: Were conventional equipment fails .....

Depending on the status of the supplies and the range over which the craft has to operate the craft has to have a fuel supply which enables it to operate for at least 16 hours or more.
Princess could carry 1000 L of diesel fuel, needing a minimum of 300 L for trim.

When we started out designing craft we thought that electronics could take over a lot of tasks from the pilot. However its better not to have the electronics at all so you don't have to worry about replacing them when they break down. And Murphy's law applies here things break down, and always when you least want them to do so.

Having a reversible pitch propeller is advisable, it enables the craft to be backed out from odd corners downwind, and it allows tricky manoeuvring in close quarters.

Following the successful operations of 1993 and 1995 the craft was incorporated into the national disaster plan.
The people drafting the plans accepted the phenomena Hovercraft. Small wonder if you consider that hovercraft are not allowed to operate under current Dutch legislation.

12: Design Evaluation.

Tuchone Princess was a compromise craft. The deutz engine in it lacked the real power the later craft got with the MAN engine. The lack of in wind performance did not really show because of the weather conditions. But everybody who has operated hovercraft knows it's nice to have the extra power in some situations.

The wide sidebodies well overhung the skirt were an advantage keeping the skirt clear of larger objects (lampposts). The sideboards, made of FRP (Fibre Reinforced Plastics), however were not impact resistant enough to withstand higher impact loads.

The cockpit windscreens reach to high which causes reflections direct in the cockpit thus hampering nigh operations when using searchlights. The 12 seat, aircraft type, arrangement is nice but not practical under these conditions. The u-shaped bench is more practical.

Not enough searchlights had been fitted . Al the systems placed on the duct are to sensitive to vibrations causing interference in radar an marine band receivers, and causes the systems to break down.

Quick DC - connections are a must on a craft. Access to main Electro distribution boxes is a must at all times, and these were well tucked away under the pilots seat.

The skirtdesign lacked enough rip stoppers. One is needed at least every meter of skirt along the pheriphery of the craft. The depth of the skirt could as well be increased.

Conclusion:

We had to learn by being thrown into the water ad we had to keep swimming. We learned from our mistakes and the second time round is was an almost perfect show. What I regard as one of the major assets of this operation is the fact that from then on the authorities started to think about hovercraft and when to use them.

The design of the craft we had hadn't come about in a normal way you would expect. We had to learn the practical side of the craft. Much later it unfortunately proved to be impossible to get the correct changes approved and incorporated by the company. On the other hand we were fortunate to be able to help the people.

Addenda:

Specification of the Hovercraft Tuchone Princess :

Length on cushion	12.5	M
Length of cushion	11.5	M
Beam overall	5.7	M
Width sideboard	1.74	M
Length sideboard	11.5	M
Total Height on landing pads	3.25	M
Obstacle clearance	.45	M
Width cabin	2	M
Length cabin	4.6	M
Height cabin/cockpit	1.7	M
Max payload	1500	kg
Empty weight	3300	kg
Max Fuel Capacity	1000	L
Cruising speed fuel consumption	~28	L / h
Max. Speed over water	30	knots
Cruising Speed	28	knots
Max Wind Speed	6	
Max. wave Height	.75	m
Engine	Deutz 6 Cyl. Aircooled, 141 kW	
Thrust	Hoffmann VP Prop 1510 mm Diameter	
Lift	Asselbergs & Nanchenius Axial Flow fan	
Transmission	Toothed Belt Cardanic drive shaft	
Electrical system	24 Volts	
Main construction Material	FRP	

The craft was constructed under CCG - Rules and inspected by Mr R.G. Wade in 1993.