

PILOT SUITS - COLD PROTECTION IN A WET ENVIRONMENT

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INTRODUCTION

In Germany about 1.100 port, river and sea pilots are on duty. Most boardings are made from small pilot ships, except in the ports and some very seldom cases when the pilots approach by helicopter. During the very often difficult boarding under rough weather conditions in the North and Baltic Sea, accidents with a fall into cold water with annual mean temperatures between 9 and 10°C may occur. A short time ago we had cases of drowning in this working field [3].

MATERIALS AND METHODS

Discussions with pilot associations and the federal pilot chamber were followed by discussions with lifejacket and protective clothing producers to find out what might be useful and available on the market. 21 cold protection/weather protection suits were collected together with several different lifejackets of EN standard 150 and 275 Newton [1], [2].

Voyages on pilot ships, tenders and cargo ships were made to study the piloting procedures. A questionnaire with 27 questions was sent to 330 pilots working in the River Elbe area. An immersible manikin (RAMM 11) was dressed with different configurations of protective clothing and equipped with different lifejackets. After this the manikin was exposed to a free footward fall into the water from a height of one metre above the surface, equipped with an electronic measurement device (notebook computer incl. optoelectronic sensors). It was measured how long it took to get mouth and nose free of the water after falling into it.

The same measurement equipment was used in the wave pool of the German Navy, Neustadt, where the manikin, incl. lifejacket and different protective clothes, was exposed to waves of 80 cm to 100 cm height. Time and frequency of nose or mouth flooding, caused by the waves, was measured. 13 pilots, dressed with different

protective clothes, from uninsulated trousers with jackets to uninsulated water-proof overalls up to insulated overalls, were exposed to a cold water pool with water temperatures between 7.5 and 8°C. These tests were carried out in accordance with IMO Regulations, except the water temperature. The following temperatures were measured: air, water and the person's hand, foot, loin and rectal temperature. The data were collected every twenty seconds by Hewlett Packard equipment connected to Yellow Springs sensors. The Hamburg Chamber of Medicine's review board (ethic commission) approved of these measurements.

RESULTS

56.4% of the questionnaires were returned, e.g. by the River Elbe Pilot Association. The majority of these pilots (95%) preferred to wear protective clothing. 5% thought that would not be necessary. 52% favoured insulated and 43% non-insulated cold protection clothing. These data can only be an example of all the answers.

The flooding test (Fig. 1), of one suit type and 8 different lifejackets as an example, shows a flooding time of about 4% to 33% of the whole trial time of 10 minutes if the manikin was equipped with a 150 N lifejacket. The 275 N lifejackets were much better, the level was between 0.1% and 7% of the trial time.

The uprighting showed nearly the same relation between 150 and 275 N, except one lifejacket which performed badly. The data shown in Fig. 2 as an example present an uprighting time of 15 to 94 seconds with 150 N lifejackets and 4.7 to 97 seconds with the 275 N jackets. The last one which worked very badly was a prototype and did not appear on the market after our results were shown to the producer.

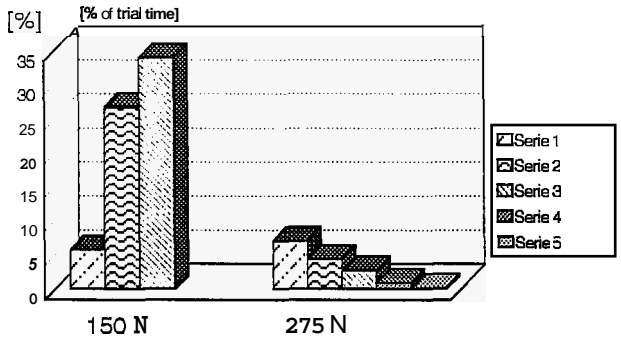


Fig. 1: Flooding Pilot Suit / LifeJackets (150 and 275 N buoyancy)

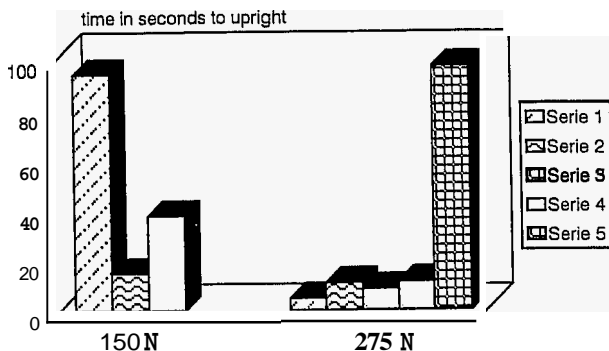


Fig. 2 Uprighting Pilot Suit / Life Jackets (150 and 275 N buoyancy)

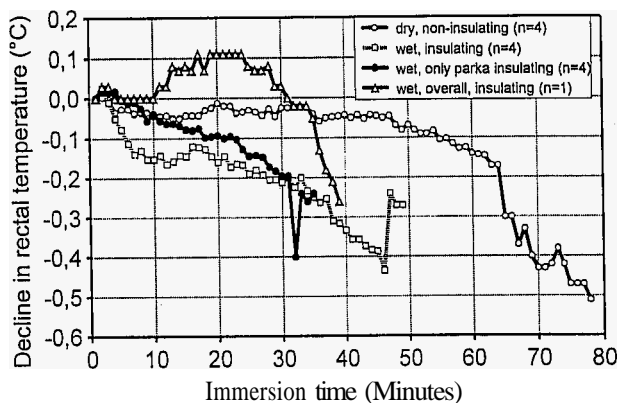


Fig. 3: Rectal Temperatures Pilot Suits / 7.5°C Cold Water Trials

Cold tests with different clothing were carried out in a cold water pool. During these trials 13 pilots had to be dressed with different clothing and had to enter the pool for a period of at least 30 minutes with wet insulated and 60 minutes with dry non-insulated suits. During that time the temperature measuring took place. Because of the bulkiness of insulated overalls the pilots rejected this sort of equipment and tried to favour somewhat insulated jackets with uninsulated trousers. Fig. 3 shows the measured mean values. In all trials the pilots dressed with non watertight jacket and trousers stayed at least 30 minutes in the water with a maximum heat loss of the core temperature of about 0.2°C. Some of them stayed a bit longer in the water as is to be seen on the graph. Because the pilots rejected

the fully insulated overall, because of its bulkiness, we could not measure this equipment in cold water but we could measure *dry* non-insulated overalls which were worn by 4 test persons with their standard underwear plus trousers and one pullover. As can be seen on the graph they were able to stay at least 60 minutes with a heat loss lower than 0.2°C. Some of them stayed nearly 80 minutes with a core temperature loss of not more than 0.5°C.

The wearing tests which took place in nearly every pilot station with all different combinations of clothing showed that most pilots would prefer uninsulated trousers with an insulated jacket and would not be willing to wear overalls.

CONCLUSIONS

Our findings show that lifejackets used together with weather protection or cold protection suits should be at least in consensus with the EN 275 standard and should be well shaped. Sufficient cold protection for a survival time of between 1 and 2 hours in our latitudes makes a water-tight overall, which need not be insulated, necessary. Uninsulated trousers with jackets, the latter might be insulated, **are** not fully sufficient. If such clothes are to be worn, the jacket at least has to be equipped with a neoprene protection in the loin area connected with a beaver tail neoprene part to prevent the lower body parts from quick water exchange with cold water.

REFERENCES

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2. Lifejackets and personal buoyancy aids. Lifejackets - 275 N. EN 399; 1993.
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