that can go ahead in 1968 is the work in Euratom's own laboratories.

The French view of the association contracts is that, if the work is worth doing, the money will eventually be forthcoming, but that the contracts must be left in suspension until the new arrangements for co-operation can be worked out. The French argue that it is no longer sensible to produce a grand plan detailing all that needs to be done; instead, each individual decision should be agreed by the Euratom members. This formula, the argument goes, need not be applied rigidly, and if any member of Euratom wanted to opt out of any particular project it could do so, leaving five, four or even three countries collaborating. With this as a basis, it would be impossible for any single country to veto a project which the others wanted to support.

Developing Hovercraft

WHEN the first hovercraft flew nearly nine years ago, it did so without the aid of flexible skirts. The air cushion beneath the craft was kept in place by jets of air around the periphery, which produced a hover height of ten inches. But, as Mr W. C. Crago, Chief Research Engineer for the British Hovercraft Corporation, explained to the Institution of Mechanical Engineers on December 12, this was an unsatisfactory solution. It used far too much power, so much that, without enormous power units, hovercraft designed then would have had a clearance of only about 1 ft., not enough to clear even quite small obstacles. The solution was the invention of the flexible skirt—which offered increases in hard structure clearance by as much as eight times. But the arrival of skirts brought further development problems, and these formed the substance of Mr Crago's talk.

The modern hovercraft skirt, Mr Crago explained, is a sophisticated inflated structure, consisting of an upper bag portion which is more or less self supporting —and acts as a shock absorber in heavy waves—and a series of discrete fingers which hang from it. One of the critical parameters is the pressure inside the skirt. There are two opposing demands—to form a stable structure, skirt pressure should be high, but, to minimize drag and improve hover performance, a low skirt pressure is better—and a compromise, based on model testing, is usually adopted. Hovercraft also demonstrate a form of behaviour known as "plough-in", for which there is no real counterpart in other marine craft. The pictures show this process happening to an SRN 6 hovercraft during trials. As can be seen, the process is started by the contact of the skirt with the water; the drag then causes the nose to dip even further, and if unchecked the process can lead to overturning of the craft. Fortunately, the process is well understood, and Mr Crago said that skirts of low hydrodynamic drag should be used; for this reason, skirts with fingers are particularly suitable. Another possibility under active investigation is the lubrication of the skirts by air, which is blown down the outside of the skirt and reduces drag at the point where the skirt comes into contact with the water. This seems likely to be a very useful development.

As well as the danger of overturning at high speed after plough-in, low speed overturning can sometimes be experienced. This happens at a fixed forward speed, when the length of the wave generated by the air cushion is the same as the length of the craft. Again cushion pressure is an important criterion. Finally, Mr Crago discussed the problem of skirt wear. One of the problems in investigating wear, he said, was that it was difficult to reproduce in the laboratory the type of

An SRN 6 hovercraft "ploughing in". Photograph by permission of the Institution of Mechanical Engineers.

wear—delamination—shown by the cushions in operation. Ultimately it was found that a specimen mounted in the outlet of an air blower could be made to flap like a flag, and produce delamination of the material much like that observed in practice. As a result the skirts, which consist of a nylon or terylene core coated on both sides with rubber material, have been markedly improved.