if she had to jeopardize these one-way mission bombers. In the early 1960's it is expected that the ballistic missiles will have reached a stage of reliability whereby such missiles will replace the bombers as the primary means of delivering nuclear weapons on North America. However, if an attack on this continent is made in the early 1960's it is considered quite probable that a variety of weapons would be used in an effort to saturate the defences and thus deliver a devastating attack.

This kind of attack would include ballistic missiles, both long and short range, land based or from submarines, as well as other nuclear weapons delivered by aircraft. As most of the major strategic targets are situated in the United States it is more than likely that certain targets in Canada would be attacked by bombers, although the primary threat would be from the ICBM's.

It is not possible to say with any degree of accuracy when the ICBM will be available in sufficient numbers to take on all the targets in North America, or when we can completely dispense with the requirement for defence against the bomber. In other words we believe we may have to face a combination of weapons, some delivered as ballistic missiles and others from manned bombers. Thus the possibility of attacks on Canada by manned bombers may extend into the mid-1960's, although the threat, compared to the missile, would be on a diminishing scale.

The next point to mention is the lead time necessary and the risk involved in research and development of modern weapon systems. In giving evidence before a congressional committee this year the United States secretary of defence, Mr. McElroy, said:

> We are living today in an era of extremely rapid advances in science and technology. Some of the programs which appeared to have had great merit only 12 months ago, now, in view of the progress made on more technically advanced projects, no longer have the same importance or urgency.

We know that having started upon certain projects these have had to be cancelled before they were completed because of changed circumstances. From a study of research and development in the production of modern defensive equipment in the United States and the United Kingdom, and from our own limited experience, it is clear that it takes about nine or ten years to develop and produce modern, highly sophisticated defence equipment. The cost of this development and production is becoming astronomical, and there is always the risk that the end product may arrive too late, that new methods have overtaken its development or that the enemy threat has changed considerably.

[Mr. Pearkes.]

As an example of the costs and complexity of these development problems it was shown in the evidence produced before the United States congressional committee this year that the Bomarc missile has been under development for over eight years and has cost so far $1.9 billion, while some $3.7 billion has been expended on the Nike-Ajax and the Nike-Hercules missiles.

It is clear that a country the size of Canada cannot embark unilaterally on any of these long range, technical and costly development programs. We must of necessity take advantage of our position in the western alliance and be able to obtain proven equipment from our partners to meet our limited requirements, thus avoiding the exorbitant cost of development and the risk of failing to produce the weapons in time to meet the threat. Thus, we are pursuing a policy of production sharing, the details of which have already been communicated to the house by the Minister of Defence Production.

Earlier I mentioned the changing threat and expressed some doubts as to whether or not we are in a position to forecast accurately this threat either in time or in character. This dilemma is further exaggerated by the trend of future development, which indicates a much more rapid technological advance in the weapons of offence than in the defensive type. It may be said with some degree of certainty that the weapons available in the next few years can produce total destruction, but the defence against these weapons is a different story and that causes us great concern. This is one of the matters to which all members of the alliance must devote a great deal of attention.

As has already been announced, the defence research board is working with the United States authorities in solving some of these problems of defence against ballistic missiles. These are problems in relation to tracking ballistic objects in and beyond the atmosphere. Some progress has been made in the field of detection of missiles, and a comprehensive communications system is being installed to give warning of the approach of the ballistic missiles. These detection stations to which I refer are not located in Canada, although Canada is providing facilities to assist in the communication and passing on of the information. It is expected that by 1961-62 a reliable detection and warning system will be in operation on the North American continent, but this is only one aspect of the problem.

The major question to be answered is how to intercept the ballistic warhead and destroy it before it reaches its target. This is a research and development project of very great technical and financial proportions, as these