CDC Papers
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29 Jan 1954

53/28
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SECRET

MEMORANDUM TO CABINET DEFENCE COMMITTEE

Proposal for a Vertical Take-Off Fighter

1. Early in 1952 Mr. J. C. M. Frost of A. V. Roe Canada conceived a new kind of aircraft capable of vertical take-off. For some time he worked on the evolution of this idea in his own time. When he presented the idea to the A. V. Roe management and to the RCAF and DRB the suggestion seemed sufficiently important to deserve further study. Therefore during the latter part of 1952 and early 1953 a group of about a dozen draftsmen and engineers worked out the details of the scheme at A. V. Roe, Malton. This work was paid for out of the RCAF Development Vote. By early 1953 the proposal was sufficiently defined that it could be submitted to other authorities for evaluation. The proposal has been carefully studied by the RCAF, the Defence Research Board, and experts in the U.K. Ministry of Supply. It has also been inspected by several senior officers of the USAF. The opinions expressed by those who have studied the proposal are in general favorable. They vary from several which are outspokenly enthusiastic to a single expert who has said that he feels the whole proposal is a waste of time. With the exception of this single dissenting voice all others have agreed with greater or less enthusiasm that it would be most unwise to drop the project at the present stage since it is certainly promising and may possibly be of revolutionary importance.

2. Briefly, the proposal that Mr. Frost and A. V. Roe Canada have advanced is to make a jet engine of conventional thermodynamic design but to arrange the elements in the shape of a flat circular disc instead of the conventional cylinder. This disc-shaped engine is then used as the basic structural element of an airframe. This results in an aircraft having the appearance of a thin delta shape with the wing tips eliminated. The advantages claimed for this aircraft are that it will be able to take off and land vertically and will be simpler, cheaper and lighter than conventional aircraft developed for the same role, will have outstanding supersonic performance at very high altitudes and may possibly have very important advantages in stability at low and trans-sonic speeds. There is not yet sufficient information available to be sure that these claims will all be realized but the consensus of opinion is that they will be. Because this promising idea arose in Canada it is felt that it should be pursued in Canada at least to the point where it can be rejected or wholeheartedly and enthusiastically supported. Production of a flying prototype might well cost as much as $20,000,000 over a period of five years or more. However, since there is little past experience to guide the development of an idea so novel it is desired to proceed in stages. Progress can then be carefully reviewed at the end of each stage before proceeding to the next. Should the proposal at any time seem unpromising it will be possible to terminate it. However, even if the programme should be terminated after a year or two the information so obtained will be of great value to the general development of supersonic aircraft.

3. Approval is now sought to proceed with phase 1 of such an exploratory research programme. This phase would include:

1. A detailed study of the aerodynamic characteristics and in particular the influence of the peripheral jet. This work would be done mainly by the National Aeronautical Establishment.

2. A more detailed theoretical study of the effect of gyroscopic forces from the engine rotor on control of the aircraft. This theoretical study will probably have to be supplemented by actual flights of rocket boosted scale models. Much of this work would be done by the Canadian Armament Research and Development Establishment.

3. The proposals for engine main bearings, shroud seals and certain features of the aircraft structure must be tested in full scale mock-ups. This and continued design studies would be done by A. V. Roe.

If these stages of the investigation show promise it would be desirable to build a scaled-down model of the engine. This would complete phase 1.

4. In order to separate this project from the main work of A. V. Roe Malton it is proposed that the staff presently working on the project be removed from the A. V. Roe plant at Malton and be placed under DRB control at the former De Havilland plant at Downsview which has recently been taken over by the RCAF. The A. V. Roe Company would be reimbursed for actual expenditures but not overhead in connection with the personnel on loan and would also be reimbursed for expenses incurred by the Company since the project was reinstated in September and prior to the move to Downsview. In addition, some of the work would be done at the Nobel plant of A. V. Roe Limited where large volumes of compressed air needed for some of the tests are readily available. Phase 1 of the project is expected to cost about $2,000,000 and to require 18 months to 2 years for its completion. $250,000 of this money is available this fiscal year from RCAF Development funds. Funds for next year have been provided in RCAF and DRB estimates.

MINISTER OF NATIONAL DEFENCE

Department of National Defence
January 26, 1954