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WAR DEPARTMENT
AIR CORPS, MATERIEL DIVISION

HHD/mvm/52

MEMORANDUM REPORT ON

SUBJECT: Evaluation of P-24 Engine and Coaxial Rotating Propellers.

Date August 27, 1941

SECTION Experimental Engineering

SERIAL No. EXP-M-52-592-29

Classification Cancelled
CG WADC
11-29-51
By L B Loed
USO

Contract No.
Expenditure Order No. 592-1
Purchase Order No.

A. Purpose

1. Evaluation of the British Fairey P-24 engine and coaxial rotation propellers, as required by Experimental Engineering Section Personnel Order serial No. 149, dated August 9, 1941.

B. Factual Data

1. Factual data is covered in the following exhibits:

a. Exhibit "A". Experimental Engineering Section Personnel Order serial No. 149, dated August 9, 1941.

b. Exhibit "B". Report submitted by Captain A. Graham Forsythe of the Fairey Aviation Co., Ltd., Hayes, Middlesex, England.

c. Exhibit "C". Excerpt from report by R. M. Hazen on the Fairey P-24 Engine.

d. Exhibit "D". Experimental Engineering Section Memorandum Report serial No. EXP-M-57-503-428, subject: "Fairey P-24 (Monarch) Engine", dated August 22, 1941.

e. Exhibit "E". Experimental Engineering Section Memorandum Report serial No. EXP-M-51/M784, subject: "Study of Fairey P-24 Aircraft Engine", dated August 25, 1941.

f. Exhibit "F". Experimental Engineering Section Memorandum Report serial No. EXP-M-52-587-12, subject: "Dual-Rotation Propeller System Used on P-24 Engine", dated August 21, 1941.

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C. Conclusions

1. Reference Exhibit "A", Experimental Engineering Section Personnel Order serial No. 149, paragraph 1, a, which reads: "Determine whether or not this engine or the propeller or the combination of the engine and propeller is of interest to the Air Corps".

a. Interest in the Engine

(1) The Fairey P-24 engine is in the development stage only and requires a great deal of additional development work, particularly with regard to improving power outputs of 100 octane fuel in application of supercharging systems that will result in higher critical altitudes.

(2) The Fairey engine, according to Captain Forsythe, has been operated at the following horsepowers:

5 hours at 2000 to 2300 hp.
20 hours at 2000 to 2100 hp.
Total flying time - approximately 100 hours at 1500 to 1800 hp.

The engine has not been operated at a horsepower rating from 2400 to 2500 hp.

(3) As an engine, aside from the fact that two independent power units are mounted in a single crankcase, the performance is not outstanding nor are there any features that appear unusually advantageous.

(4) Fairey P-24 engine in its present version offers no advantages over available American engines from a standpoint of airplane design, particularly in regard to performance and installation designs. (Reference Exhibit "g", Experimental Engineering Memorandum Report serial No. EXP-M-51/M784, subject, "Study of Fairey P-24 Aircraft Engine".)

b. Interest in the Propeller

(1) To study the practicability of independently driven coaxial rotating propellers.

(2) The study of increased performance that can be obtained between two halves of the dual rotation propeller while operating at different r.p.m.'s in flight.

(3) The study of the lubrication problems and durability of the plain bearings used between the coaxially rotating propeller shafts on which the Fairey propeller is mounted.

(4) The study in flight of the practicability of feathering one-half of the dual rotation propeller while the other half of the dual rotation propeller is in operation.

c. Interest in the Engine-Propeller Combination.

(1) The Air Corps is interested in the Fairey P-24 engine and propeller combination which has been tested on the ground and in flight. Since the propeller has been designed especially for the P-24 engine it would be necessary to use the P-24 engine with this propeller for experimental purposes in this country. (There are no engines being developed or manufactured in the United States that would be suitable for installation of the Fairey dual rotation propeller in its present form.) All engine models being developed in the United States which contemplate using dual rotation propellers will employ gearing which will drive both propellers at the same speed. No provision has been made for actuating the control mechanism of the Fairey propeller through the center of the inner coaxial rotating shaft.

2. Reference Exhibit "A", Experimental Engineering Section Personnel Order serial No. 149, paragraph 1, b, which reads: "If these items are of interest to the Air Corps, determine whether or not the Air Corps should help the Fairey Company in carrying the development on in the United States by either (1) helping Fairey finance it within the United States, or (2) recommending a manufacturer."

a. The Air Corps is not interested in the development and production of the Fairey P-24 engine and does not recommend financing the Fairey Company. Therefore, no manufacturers are recommended.

b. If flight tests prove the Fairey dual rotation propeller to be superior to dual rotation propellers being manufactured by the United States, it is recommended that they be assisted financially in producing these propellers in the United States.

The Aviation Manufacturing Corporation, of America, is recommended as a manufacturer for the Fairey propeller in the United States.

3. Reference Exhibit "A", Experimental Engineering Section Personnel Order serial No. 149, paragraph 1, c, which reads: "If this engine-propeller combination is of interest to the Air Corps, determine whether or not it would be to our advantage to have the Fairey Company bring over from England a small airplane in which a smaller model of this engine and propeller is installed."

a. It would be to the advantage of the Air Corps to have Fairey Company bring over from England an airplane equipped with P-24 engine and Fairey dual rotation propeller. It is preferred that the highest horsepower engine available be used and that the engine-propeller combination be installed in an airplane that will do at least 400 m.p.h.

D. Recommendations

1. It is recommended that no further action be taken to develop the P-24 Fairey engine in the United States.

2. It is recommended that the P-24 engine with the highest horsepower rating obtained to date, and the dual rotation propeller be installed in an airplane and brought over from England to the United States to conduct tests proposed in Conclusions of this Memorandum Report, paragraphs c, (1), (2), (3) and (4). Ample spare parts should be provided to allow for at least five hours flight testing. It is recommended that this combination be installed in an airplane having a high speed of at least 400 miles per hour. Information obtained with this engine-propeller combination in an airplane having a high speed of less than 350 miles per hour would be of little value except to determine the durability of the propeller.

3. It is recommended that design studies be made for a dual rotation Fairey propeller that can be mounted on the dual rotation engines that are now being developed in the United States. This will require a

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complete new design due to the fact that the gear system used on United States engines does not permit passing the control mechanism for the dual-rotation propeller through the center of the inner coaxial rotating shaft.

Prepared by - E. R. PAGE, Lt. Col., A. C.
Paul H. Kemmer
PAUL H. KEMMER, Lt.Col., A.C.
H. H. Couch
H. H. COUCH, Major, Air Corps
(Name)

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Chief, Propeller Laboratory.

Concurrence:

P. O. Hamrol
Approved by P. O. HAMROL, Lt.Colonel, A.C.
Chief, Experimental Eng. Section

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Central Files

FOC:lmf

August 9, 1941

EXP. ENGR. SECTION
PERSONNEL ORDER
SERIAL NO. 149.

1. The following named officers are designated as an engine evaluation committee on the British Fairey P-24 engine and co-axial propellers:

Lt.Colonel B. R. Page, O-10149, Air Corps
Lt. Colonel P. M. Kemmer, O-14732, Air Corps
Major H. H. Couch, O-16009, Air Corps

This committee will make a thorough study of the drawings and data submitted to the Division and will submit recommendations on the following points:

a. Determine whether or not this engine or the propeller or the combination of the engine and propeller is of interest to the Air Corps.

b. If these items are of interest to the Air Corps, determine whether or not the Air Corps should help the Fairey Company in carrying the development on in the United States by either (1) helping Fairey finance it within the United States, or (2) recommending a manufacturer.

c. If this engine-propeller combination is of interest to the Air Corps, determine whether or not it would be to our advantage to have the Fairey Company bring over from England a small airplane in which a smaller model of this engine and propeller is installed.

2. For the information of the committee, it is understood that in case the engine and propeller are not of interest to the Air Corps, General Brett expects to let the Fairey Company go ahead on their own in this country.

3. It is requested that this report be submitted at the earliest possible date and not later than August 23, 1941.

F. O. CARROLL,
Lt. Colonel, A. C.,
Chief, Experimental
Engineering Section.

Exhibit "A" to
M.R. EXP-M-52-5-92-29

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Exhibit "A"
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C-46 8-8-41

ASSISTANT CHIEF, MATERIEL DIVISION

With reference to EXP-T-644, 8-7-41. Mr. Forsythe came to this country with his idea in regard to Fairey P-24 engine and co-axial propellers as result of conversation between Mr. Fairey and General Brett. Specifically, they desire to continue the development and manufacture of this engine in this country. My understanding is that their project was in competition with the Saber in England, and due to various reasons the British Government desired to put the Saber into production instead of the P-24. Mr. Fairey and Mr. Forsythe think that the British Government made a mistake, but are unable to do anything about it at this time, and therefore thought perhaps the project would be of interest to us, and if it is not of interest to us, they still desire to be permitted to contact some manufacturer of their own choosing with a view of having the project carried on. General Brett told Mr. Fairey that he desired that our engineers have an opportunity to study the project and determine whether or not it is of interest to us. If it is, that we perhaps would help him in carrying it on in the United States by either perhaps helping him finance it, perhaps recommending a manufacturer. If it is not of interest to us, it is my understanding that General Brett expects to let him go ahead on his own.

The question in my mind is as to what value the project is from the point of view of the co-axial propellers and to what extent can we expect better take-off characteristics from this arrangement, as I think we know that the problem to take-off with our high wing loading and with our larger engine is becoming more serious all the time. Is there anything in this idea which we should support? My understanding is that in the event that we do not believe that the propeller combination is as efficient as is alleged, that Mr. Fairey and Mr. Forsythe would be willing to have brought over from England a small airplane, in which a smaller addition of this engine and propeller is installed, and would be willing to show us the results that they have obtained in approved take-off with this installation.

In view of the above, the question is as to whether we should ask Mr. Fairey to bring the airplane over, as to whether the arithmetic produced indicates a great improvement in take-off, and, in view of the above, plus the engineering information available, are we, the Army Air Corps, interested in cooperating with this from the point of view of a development project?

NICHOLS

HP

3:00 P.M.

Exhibit "A" to
M.R. EXP-M-52-592-29

COPY

Exhibit A

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EXCERPT FROM REPORT BY R. M. HAZEN

The Fairey P.24

The Fairey Company has had under development for approximately four years a 24 cylinder vertical 'H' engine which the English government has not as yet actively sponsored. At Mr. Devereux's request, arrangements were made with Captain Forsyth who is responsible for the engineering, to see this engine. The engine is an exceptionally clean design of 53 liters capacity and is expected to do 2000 horsepower with ratings in general about the same as the Napier Sabre. The weight is 2250 pounds. The unusual feature of this engine is that the two 12 cylinder units function separately throughout and are connected separately through a reduction gear assembly to dual opposite rotation propellers. Either engine unit can be started and operated separately. The writer inspected one engine on a test bed and another in a work-horse airplane installation. The latter engine was started and operated on the ground. Each engine was started individually by a single starter operating through a shift mechanism to the particular unit. There appeared to be no interference effects between the two propellers. One engine could be revved up with the other idling with apparently no effect on the R.P.M. of the idling engine. Shadows formed with stroboscopic effects which would probably be disconcerting to the pilot when engine speeds were not synchronized. It was claimed that one engine had been in operation in this aircraft for almost one year without change. It was also claimed that frequent flights had been made with the airplane cruising with one unit completely out of operation. It is understood that since the British government was sponsoring the Napier Sabre, it would probably not undertake the additional development of this engine although the airplane was scheduled to go to Farnsboro for observation and test the following day. It is also understood that a Typhoon is being built for installation of one of these engines. The oil and coolant systems were entirely separated and the propeller operation could be either separated or synchronized as between the two units. It is understood that Captain Forsyth may come to this country within the next two or three months with the idea of attempting to interest American manufacturers in the product. Mr. Devereux expressed himself as believing the design was considerably cleaner than the Sabre and a much better production job although he thought that two or three years development still remained before it would be ready for production. I gathered that it was in its present stage a fairly good engine at 1500 horsepower and 2250 pounds. The engine is a poppet type three valve engine using a twin intake and twin exhaust ports on all except the end cylinders.

Exhibit "C" to EXP-M-52 592-29

Exhibit "C"

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