

5 MAR 1943

AIRCRAFT AND ARMAMENT EXPERIMENTAL ESTABLISHMENT

BOSCOMBE DOWN

UNCLASSIFIED

TS. 187/63

Kittyhawk II F.L.220
(Machin. No. 1850-1)~~RESTRICTED~~ PILE COPYA. & A. E. E. ref: 4484/1-A. S. 76/4
M. A. P. ref: RA. 1871/D. A. N. A. 1.
Date of test: 24th August, 1942.

DATE	STOCK
5/1/53	12

ISSUE TO	99 AUTHORIZED
Progress of issue	of report

Report No.	DATE	Title
12	6.1.53	
5th Part of A. & A. E. E. /783, a.		F.L.220 - Engine cooling trials.
6th do.		F.L.220 - Radio trials - communication sets.
7th do.		F.L.220 - Cabin heating tests.
8th do.		F.L.220 - Fuel consumption tests.
9th do.		F.L.220 - Brief handling trials.

This report deals with the aircraft (or equipment) as tested. Action to remedy defects, or decisions to accept items not in strict compliance with the specification, are matters for decision and action by the Ministry of Aircraft Production.

1. Introduction.

Measurements of take-off run have been made on Kittyhawk II F.L.220 as part of the general performance trials on the type.

2. Condition of aircraft relevant to tests made.

2.1. General. The main features of the aircraft were:

Six 0.5" guns, three in each wing, the muzzles protruding about 3 in. from the leading edge of the wing being tape-bound, but the ejection chutes under the wings being open.

Aerials from the fin to the wing tips and to the rear of the cockpit.

I.F.F. aerials between the sides of the fuselage and the tail-plane tips.

No aerial mast.

An external rear view mirror above the windscreen and slightly to port.

A landing lamp fitted in the port wing.

Fittings under the fuselage to take an internal overload fuel tank or a bomb, (but neither of these were fitted when these tests were made).

Slots in the under surface of the wings for bomb racks.

A Kollsman Type D.24.V. D.C. pressure head on the leading edge of the port wing (See 4th Part of this Report for details).

2.2. Propeller. Details of the propeller are given in the following table:-

Type of propeller	-	Curtiss Electric
Serial No.	-	32236
Diameter	-	11' 0"
No. of blades	-	3
Direction of rotation	-	R.H.
Pitch range	-	30° 0'
Coarse pitch	-	56° 30'
Fine pitch setting	-	26° 30'
Material	-	Metal

A. & A. E. E. Calibration at 42 in. radius

	Fine pitch	Coarse pitch
Blade No.1	26° 29'	56° 35'
" No.2	26° 32'	56° 40'
" No.3	26° 30'	56° 37'

TEST REPORT No.

Date.

AEROPLANE.

No.

ENGINE TYPE.

SPECIFICATION No.

DUTY.

CONTRACTOR.

INDEX TO ACCOMPANYING PAGES.

Page No.	Subject.	Page No.	Subject.
<u>DATA.</u>		<u>GENERAL REMARKS.</u>	
1.	Summary of Trials.	39.	Design and Construction.
2.	Weights and loading data.	40.	Power Unit and Installation.
3.	Description of Aeroplane.	41.	Service Maintenance.
4.	Engines.	42.	Military Qualities.
5.	Cooling System.	43.	Flying Qualities.
6.	Airscrews.	44.	Water Handling Qualities.
7.	Fuel System.	45.	Summary. Type Requirements.
8.	Lubrication System.		
<u>PERFORMANCE.</u>		<u>ILLUSTRATIONS.</u>	
9.	Climbing Trials.	Fig. 1.	Rate of Climb and Time to Height and mean Temperature.
10.	Speed Trials.	Fig. 2.	Level Speed and R.P.M. at Height and mean Temperature.
11.	Fuel Consumption Tests.	Fig. 3.	Pitching and Tail Settings for Trim.
12.	Water Cooling Tests.	Fig. 4.	C.G. with distribution of removable load.
13.	Oil Cooling Tests.	Fig. 5.	Rigging (containing table of measured dimensions and simple water lines for floats and boats).
14.	Oil Cooling Climb.	Fig. 6.	Surface Areas and Sections.
15.	Oil Warming Tests.	Fig. 7.	Fuel System (Diagrammatic).
16.	Gliding Tests.	Fig. 8.	Lubrication System (Diagrammatic).
17.	Spinning Tests.	Fig. 9.	Water Cooling System (Diagrammatic).
18.	Controllability and Manoeuvrability.	Fig. 10.	Gearing and maximum movements of control.
19.	Diving and Stability Tests.	Fig. 11.	Field of Fire.
<u>ARMAMENT.</u>		Fig. 12.	Ground Firing.
20.	Fixed Guns, Air Requirements.	<u>PHOTOGRAPHS.</u>	
21.	Fixed Guns, Ground Maintenance.	Engine Log Book.	
22.	Fixed Guns, Firing Trials.	Four photographs of aeroplane including front three-quarter front, and side view showing scale post.	
23.	Free Guns, Installation and Maintenance.		
24.	Free Guns, Firing Trials.		
25.	Pyrotechnics.		
26.	Bomb Gear, Installation.		
27.	Bomb Gear - Ground Trials.		
28.	Bomb Gear - Air Trials.		
29.	Torpedoes.		
30.	Camera Gun.		
<u>INSTRUMENTS.</u>			
31.	Bomb Aiming.		
32.	Wireless - Air Trials.		
33.	Wireless - Ground Trials.		
34.	Photography.		
35.	Oxygen Equipment.		
36.	Electrical.		
37.	Flight and Navigation.		
38.	Automatic Controls.		

2.3. Loading. The aircraft was flown at the following loading:-

Condition	Weight	C.G. position Ins. aft of datum (measured with u/c down)
(a) Day and night fighter load	8910 lb.	24.7

The centre of gravity limits due to dissipation of load are from 19.1 in. to 25.4 in. aft of the datum point.

2.4. Engine numbers and limitations. A Merlin V.1650-1 engine No. A.618/41-16725 was fitted. The relevant engine limitations at the time of test were:-

	R.P.M.	Boost, In.Hg.
Maximum permitted for take-off	3000	54

3. Tests made.

The take-off run was measured on a grass airfield at loading (a) of para. 2.3. The take-offs were made with the flaps $\frac{1}{4}$ down, since from tests made on Kittyhawk I A.L.229 it was found that this gave the best take-off performance.

Comments on the characteristics during the take-off are also given.

4. Results of tests.

With the flaps $\frac{1}{4}$ down, the following results were obtained.

	Corrected to zero wing and standard atmospheric conditions.	Under conditions of test i.e. Mean wing = 6 m.p.h. Ground pressure 29.65 in.Hg. Ground temperature 16 $\frac{1}{2}$ °C
Take-off run yds.	465	470
Distance from rest to clear a 50 ft. obstacle yds.	785	780

R.P.M. at take-off	- 2950
Manifold pressure at take-off	- 52 $\frac{1}{2}$ in.Hg.
A.S.I. at take-off	- 85 m.p.h.A.S.I.
A.S.I. on initial climb	- 101 m.p.h.A.S.I.

The take-off path is plotted in Fig.1.

5. Characteristics during take-off.

Take-off was made with the elevator trimmer set to neutral, and also some right rudder trim used. The aircraft tended to swing to the left but could be held straight by use of rudder. The tail was raised early in the run, coming up fairly easily. There was a marked tendency for the aircraft to pitch longitudinally during the run. Take-off was made at 85 m.p.h.A.S.I., the aircraft being pulled off at this speed.

Circulation List

C.R.D.	Chief Overseer
D.C.R.D.	C.I. Accidents
D.G.A.P.	D.P.C.A.
D.T.D.	A.I.2(g)
D.D.T.D.	A.I.3.
D.O.R.	R.D.T.5. 6 copies
D.D.R.D.A.	R.T.P.2. 16 copies + 1
D.D.R.D.T.	R.T.O. Air Service Training 3 copies
A.D.R.D.T.1.	
D.R.A.E. 4 copies	
R.D.T.3.	
A.D.D.A(N.A) 2 copies (1 for Action)	
A.F.E.E.	
Asst. to D.G.N.D.P.	
T.F.2.	

TEST REPORT No.

Date.

AEROPLANE.

No.

ENGINE TYPE.

SPECIFICATION No.

DUTY.

CONTRACTOR.

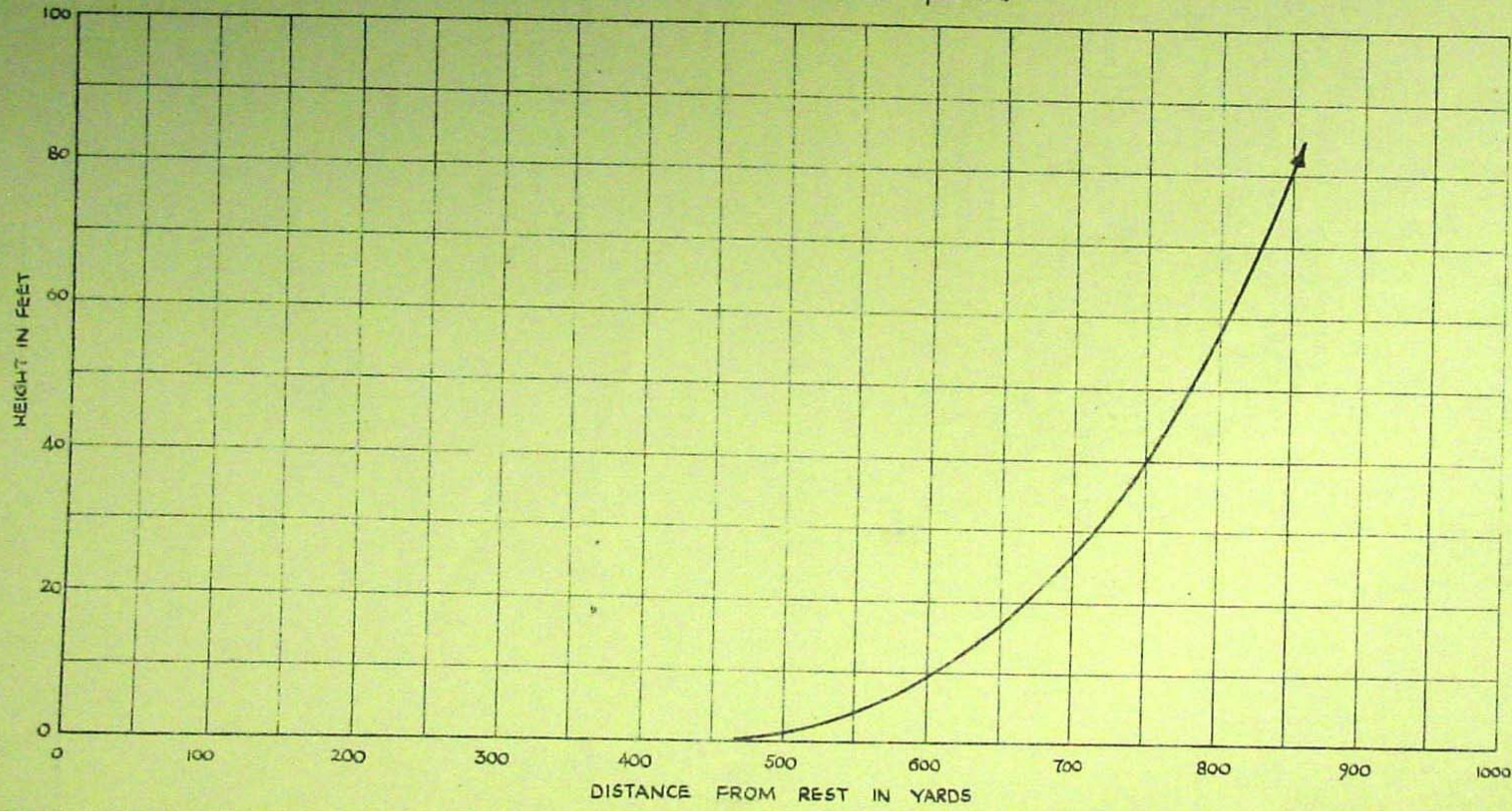
INDEX TO ACCOMPANYING PAGES.

Page No.	Subject.	Page No.	Subject.
<u>DATA.</u>		<u>GENERAL REMARKS.</u>	
1.	Summary of Trials.	39.	Design and Construction.
2.	Weights and loading data.	40.	Power Unit and Installation.
3.	Description of Aeroplane.	41.	Service Maintenance.
4.	Engines.	42.	Military Qualities.
5.	Cooling System.	43.	Flying Qualities.
6.	Airscrews.	44.	Water Handling Qualities.
7.	Fuel System.	45.	Summary. Type Requirements.
8.	Lubrication System.		
<u>PERFORMANCE.</u>		<u>ILLUSTRATIONS.</u>	
9.	Climbing Trials.	Fig. 1.	Rate of Climb and Time to Height and mean Temperature.
10.	Speed Trials.	Fig. 2.	Level Speed and R.P.M. at Height and mean Temperature.
11.	Fuel Consumption Tests.	Fig. 3.	Pitching and Tail Settings for Trim.
12.	Water Cooling Tests.	Fig. 4.	C.G. with distribution of removable load.
13.	Oil Cooling Tests.	Fig. 5.	Rigging (containing table of measured dimensions and simple water lines for floats and boats).
14.	Oil Cooling Climb.	Fig. 6.	Surface Areas and Sections.
15.	Oil Warming Tests.	Fig. 7.	Fuel System (Diagrammatic).
16.	Gliding Tests.	Fig. 8.	Lubrication System (Diagrammatic).
17.	Spinning Tests.	Fig. 9.	Water Cooling System (Diagrammatic).
18.	Controllability and Manoeuvrability.	Fig. 10.	Gearing and maximum movements of control.
19.	Diving and Stability Tests.	Fig. 11.	Field of Fire.
		Fig. 12.	Ground Firing.
<u>ARMAMENT.</u>		<u>PHOTOGRAPHS.</u>	
20.	Fixed Guns, Air Requirements.	Engine Log Book.	
21.	Fixed Guns, Ground Maintenance.	Four photographs of aeroplane including front three-quarter front, and side view showing scale post.	
22.	Fixed Guns, Firing Trials.		
23.	Free Guns, Installation and Maintenance.		
24.	Free Guns, Firing Trials.		
25.	Pyrotechnics.		
26.	Bomb Gear, Installation.		
27.	Bomb Gear - Ground Trials.		
28.	Bomb Gear - Air Trials.		
29.	Torpedoes.		
30.	Camera Gun.		
<u>INSTRUMENTS.</u>			
31.	Bomb Aiming.		
32.	Wireless - Air Trials.		
33.	Wireless - Ground Trials.		
34.	Photography.		
35.	Oxygen Equipment.		
36.	Electrical.		
37.	Flight and Navigation.		
38.	Automatic Controls.		

FIG 1.

KITTYHAWK II - FL 220.

TAKE OFF PATH
WEIGHT - 8910 lbs.
FLAPS SET $\frac{1}{4}$ DOWN.



10% PART OF REPORT NO ATAE/783a	CURVE NO 4842	TRACED BY	CHECKED BY <i>RAF</i>	DATE OF TEST	24 - 8 - 1942	APPROVED	<i>[Signature]</i>	D.O.
---------------------------------	---------------	-----------	-----------------------	--------------	---------------	----------	--------------------	------

TEST REPORT No.

FUEL SYSTEM

1. TYPE OF FEED.
2. MECHANICAL PUMPS.
Type, number and disposition,
windmill number, etc.

How connected - series or
parallel.
3. HAND PUMPS.
Type and number.
4. TANKS.
Number, capacity, air-space,
disposition, material and
construction. Time taken
to empty fuel tanks (if of
Jettison type). Contents.
gauge, type.
5. RELEASE VALVES.
Type and number.
6. FILTERS.
Size, type, number and
disposition.
7. FLOW.
Available at carburettor connection
from gravity tank only, with tail
down (by actual test).
Specified flow.
8. GRAVITY HEAD.
(Effective) at engine
measured with tail down. {Max.
Min.
9. TYPE OF FUEL USED ON TEST.
10. EXTENT OF CONTROL available and the
various combinations of tanks and
pumps, etc., which are required
during flight.