

Enclosure No. II. in Western Pacific despatch secret
of 30th October, 1936.

Enclosure No. 1 in New Zealand Submission No. 26/8808 of
14th October, 1936.

COPY

S E C R E T.

From The Commanding Officer, H.M.S.
"Achilles". at Auckland.

Date 2nd October, 1936. No. 1585/138.

To The Commodore Commanding, New Zealand
Station.

Subject.. Report of Pacific Islands Air Survey
carried out by H.M.S. "Achilles" on
passage from Gibraltar to New
Zealand.

Enclosures.. Section I... Survey Narrative.

Section II.. Suitability for Air
Bases.

Section III.. Photographic Summary.

Section IV... Remarks by Officers.

Photographs. .. Christmas Island

Fanning Island

Canton Island

Hull Island.

Herewith is submitted the report of
Aerial Survey carried out in accordance with
Admiralty Message timed 2150 of 17th July,
1936.

(Signed) I.G. Glennie,
Captain.

Y900
Enclosure to "Achilles" No.1585/138 dated 2nd October,1936.

S E C R E T.

REPORT OF

PACIFIC ISLANDS AIR SURVEY

CARRIED OUT

BY

H.M.S. "ACHILLES"

ON PASSAGE FROM GIBRALTAR TO NEW ZEALAND.

- Section I.Survey Narrative.
Section II.Suitability for Air Bases.
Sub-Section A.Christmas Island.
 B.Fanning Island.
 C.Kingman Island.
 D.Canton Island.
 E.Hull Island.
 F.Nuko-nono Island.
 G.Minerva Reef.
Section III.Photographic Summary.
Section IV.Remarks by Officers.

Section I.

Section I. ... Survey Narrative.

General

Orders were received to make a "quick Photographic Survey" of certain Pacific Islands.

The time factor raised certain problems which were accentuated by the poor charts available and the lack of navigation marks. In particular the charts available showed very little detail on the weather side of islands and this resulted in a decision to make all runs against the prevailing wind; making use of the better charted marks on the lee side as departure points.

Cloudy conditions, considerations of endurance and of the time available, however, often made it necessary to carry out runs in any direction which offered - as at Canton Island.

Oblique photographs were taken to supplement the mosaic.

Height

In spite of the considerable amount of cloud encountered it was decided not to take "verticals" below the height of cloud formation (2,500 ft) because of the prohibitive amount of film required to cover a given area - 25 times that required at 10,000 ft.

Consequently all the photographs of which the mosaics are composed were taken from an indicated height of 10,000 ft.

At Fanning Island the appearance of a thick layer of stratus and strata cumulus

after the second run made further vertical photography impossible.

Scale of Mosaic

This was based on the height corrected by applying the correction for temperature to successive 1,000 foot levels. The total correction varied very little from +390 ft. in different surveys and this correction has been taken as constant throughout the series.

The effect of diurnal change of barometric pressure on indicated height during duration of the flight has been neglected as inconsiderable.

Overlap

An overlap of 60% fore and aft and 30% laterally was aimed at. The former was well maintained throughout the series but there were wide departures from the latter figure due to the lack of suitable "pin points."

The large fore and aft overlap was made with a view to providing stereoscopic effect in order that it should be possible to distinguish dry land from submerged coral in the finished prints. In the better prints this object has been realized.

Survey Wind

In order to save time involved by finding wind at survey height it was decided that the wind at 10,000 ft. should be found

by

by smoke shell fired by the ship and the result signalled to the aircraft. This arrangement worked extremely well and enabled the aircraft to reach survey height with all necessary calculations, made for Drift and Exposure time interval.

Mosaics.

The full scale mosaics should be consulted for any points of detail. The small copy mosaics are simply for the purpose of easy reference in conjunction with the obliques which amplify the text of the report.

Obliques.

Each oblique bears a letter which appears on the copy mosaic and indicates the position from which the photograph is taken and the direction of the view.

No obliques of Fanning Island are included as they were of extremely poor quality.

Section II. Suitability for Air Bases.

Sub-Section A. Christmas Island.

Date of Survey 23rd and 24th August, 1936.

Survey Height 10,390 Feet.

Scale 1 inch represents 692.7 Yards.

Conditions for Survey.

The survey took place on two days; the afternoon of the first day and the forenoon and afternoon of the second being available for survey flying.

Throughout this period about 8/10

low

low cloud persisted over the South part of the island, and nearly as much over the extreme North making it impossible to take verticals of these areas from a reasonable height. The lagoon area, however, was normally much freer from cloud, except P.M. on the second day when the sky was completely overcast.

Remarks.

General.

Considering the area surveyed as a whole, the Western half is lagoon of varying depths, the Eastern half land and lakes with a transition area in the centre lying in a direction N.E. - S.W. consisting of land, water and coral almost awash.

The Lagoon.

Two thirds of the lagoon are shown in the mosaic - the Northern third which is not shown consists of islands and very extensive coral ledges - its general depth is probably about two feet. Within a radius of 2.5 miles from the centre of Cook Islet there is an area within the lagoon entirely free from coral obstructions except possibly on its extreme Eastern side and having throughout a depth of more than 9 feet and a general depth of twelve feet. It may be assumed that the darker areas represent a depth of over two fathoms. Outside this area to the Eastward is the transition area with coral ledges about one foot from the surface showing white in the photograph. To the South and South-West are wide spread coral patches having over them depths from one foot

to about four feet. In the extreme South West of the lagoon is a patch of about one mile square which is nearly free from coral heads but is shallower than appears from the photographs - about six feet.

The Land Area.

This is honeycombed with lakes of varying sizes and depths and of every colour from pale green and blue to dark red. They are full of numerous coral heads. The area lying to the South East of the mosaic and extending for about ten miles to the East is somewhat similar but has in places dry areas sufficiently large for an aerodrome and having a surface apparently suitable.

Suitability for Air Base.

Runways.

The area previously described as lying within the radius of 2.5 miles from the centre of Cook Islet fulfills the specified requirements for length of runways. The depth in places is less than the specified twelve feet. No other area is suitable.

Erection of Hangars.

There are numerous suitable sites for hangars and slipways.

Obstructions.

No serious overhead obstructions exist.

Blasting.

If the removal of the coral heads on the Eastern limit of the area were considered necessary

necessary it would be quite practicable.

Sub-Section B. Fanning Island.

Date of Survey 25th August, 1936.

Survey Height 10,390 Feet.

Scale 1 inch represents 692.7 yards.

The scale was checked over a known Base of 4.3 miles resulting in an error of +0.05% compared to the chart.

Conditions for Survey.

Cloud conditions were bad at first, but a small clear patch allowed two runs to be made before an extensive 10/10 layer of low cloud made further work impossible. A defect in the camera shutter blind has resulted in uneven exposure.

Suitability for Air Base.

General.

The area surveyed, though small, comprises all the lagoon in any way suitable for runways. The remainder consists of coral patches and ledges, mostly awash.

Runways.

An area lying within 1 mile radius of the centre of English harbour entrance and between the bearings 045 and 100 degrees is comparatively free from coral obstructions. Such as these are could be cleared by blasting. Outside this area the white patches in the photographs represent coral heads, patches, etc. with little or no water over them. To clear these for runways would involve very extensive blasting.

Erection

Erection of Hangars.

The land area is suitable for the erection of hangars and workshops. Slipways would have to be built clear of the deep water channel through which the stream runs strongly and would probably involve blasting.

Take off through Deep Water Channel.

This channel has a width of about 700 feet but an effective width in the direction of the prevailing wind of considerably less. There is probably a considerable swell running in the offing on most occasions; on this occasion the swell would have made a take off hazardous.

Overhead Obstructions.

There are minor obstructions in the way of palms and buildings - maximum height 70 feet.

Sub-Section C. Kingman Reef.

Date of examination 26th August, 1936.

Remarks.

No aerial survey was possible under the circumstances.

Suitability for Air Base.

The reef encloses a lagoon of dimensions nine miles by five miles at the widest point. The depth is considerable throughout with no appearance of coral obstructions. Runway requirements are completely met. The only dry land of considerable area is a small sand islet at the Eastern end of the reef about 150 yards long and 5 feet high. The reef is other
wise

*Good
position*

wise barely awash or submerged.

The lagoon would be ideal for any form of moored base vessel.

Sub-Section D. Canton Island.

Date of survey. 27th August, 1936.

Corrected survey height. 10390 Feet.

Scale. 1 inch represents 692.7 yards.

Survey wind. 065° 122 knots.

Conditions for Survey.

7/10 cumulus base 2,000 feet throughout survey. Runs had to be made haphazard whenever a clear patch allowed in the direction which gave the largest clear area.

Suitability for Air Base.

Four fifths of the lagoon is honey-combed with coral reefs and heads lying close to the surface. To clear this area for runways would require considerable blasting.

The lagoon entrance is blocked by an extensive reef nearly awash.

In the Southern part of the lagoon there is a comparatively clear area about 2.3 feet long and 7 cables wide at the northern end tapering to 4 cables at the Southern end. This area has depths of 3 fathoms generally, shoaling slightly to the Southward; but there are a few coral heads which could be cleared by blasting.

Conditions outside Lagoon.

This island does not give complete shelter from the swell which finds its way to all parts on the lee side. On this occasion
there

there was a four foot swell at the most favourable point for landing.

Conditions were probably almost the best possible as the general swell was on average from the N.E. - from which direction the island gives most shelter.

E. Hull Island.

SUB-SECTION E. . HULL ISLAND

Date of survey. 29th August, 1936.
Survey height. 10,390 feet.
Scale. 1 inch represents 692.7 yards.

Remarks

The sun almost vertically overhead caused a glare which has resulted in white patches in the finished prints.

Suitability for Air Base.

General

The lagoon is about 5 miles long and has an average width of 2 miles. It lies in a general direction E.N.E. - W.S.W. The prevailing wind blows from the East producing a swell which runs all round the island producing a considerable surf on the lee shore. It is probably normally, sufficiently moderate on the lee side to allow the loading of lighters from a ship. The beaching of loaded craft would, however, be normally impossible.

The numerous channels through the lee coast are too shallow for boat work but it is considered an easy matter to blast a deep water channel. There are large numbers of coral heads almost awash, of which the vast majority are in the South Western half.

North East half of Lagoon.

The few coral heads in this area could be removed by blasting. This would provide a clear area of sufficient dimensions to fulfil the requirements for runways. The general depth of water

is

is estimated as more than 2 fathoms. The land surface is nowhere above 20 feet; but there are a few patches up to 60 feet which do not present serious obstructions. There appear to be numerous suitable hanger sites. The construction of slipways would involve blasting operations.

South West half of Island.

Coral heads and patches are very numerous and widespread. Conditions are otherwise similar to those described above.

SUB-SECTION F. .. NUKU-NONO.

Date of examination. ... 30th August, 1936.

Remarks

Unfavourable swell conditions made an aerial survey impracticable.

Suitability for Air Base.

The lagoon is of sufficient size to meet runway requirements, provided that coral obstructions, are not too widespread.

Coral reefs were seen in the North Western area and appeared fairly extensive.

Judging from experience at Canton and Hull Islands coral is probably more widespread than appeared from bridge level.

SUB-SECTION G. .. MINERVA REEF.

Date of examination. .. 3rd September, 1936.

Remarks

Conditions of swell made an air survey impracticable.

Suitability

Suitability for Air Base.

Both reefs are similar in type to Kingman Shoal and the same general remarks apply. They are considerably smaller, but quite suitable for an emergency landing place; and in the case of the Northern shoal, suitable for the mooring of a base ship.

SECTION III. PHOTOGRAPHIC SUMMARY.

General.

The F. 24 Film Camera was used, with electrical control which functioned perfectly throughout. Batch 168 Panchromatic Film was employed with a K.2 yellow filter, and was developed by the standard Pyro Metol Stain developer supplied. It is considered that it would have been wiser to have used a non-stain developer, as the results have, in general too deep contrast.

Personnel.

The personnel had no previous experience of the type of work involved.

Exposure.

Trial exposures were made at the Marquesas Islands in what were thought to be light conditions similar to those obtaining throughout the Pacific in general. However the entire film coating stripped in the washing process, due to high water temperature (92° F), and no data were obtained. It was decided in the absence of such data, to use F=5.6 as the standard aperture and 1/90 as the standard speed.

In

In general this was done, but the southern runs at Christmas Island and all runs at Fanning Island were made using $F = 4$ and $1/100$ seconds on account of poor light due to 10/10 medium cloud at 14,000 feet. In the latter case there is noticeably uneven exposure which was thought due to acceleration of the shutter blind. The exposure setting mechanism was a source of trouble on a number of occasions as no matter how carefully it was set it slipped back to $1/40$. For this reason and because of suspected acceleration effect the shutter unit was changed after the Fanning Island survey. The second unit gave no trouble.

Developing.

The Gun Room Pantry was modified for use as a Dark Room. The initial experience of stripping at the Marquesas Islands was a set back and a cooling arrangement was evolved with a view to securing a continuous supply of water at a reasonable temperature. This consisted of a coil of $3/8$ inch copper tubing, fitting in a wooden box of 1 foot cube, through which water was circulated. The box was filled with broken ice and replenished as necessary. At the full output of the tap the water temperature was reduced 12° F. from 93° F., and temperatures as low as 65° F. were obtainable at reduced input.

A 28 lb block of ice lasted an hour with the tap running at full speed. To reduce further the risk of stripping, a Hardening Fixing Bath was employed. No further trouble from stripping was experienced. It would no doubt be possible to re-design the
cooling

cooling arrangements to give much better results.

Drying.

The portable drying drum supplied worked admirably. A certain amount of trouble from dust was experienced.

Printing.

A set of glossy prints was made of the entire survey while on passage to Auckland, and was used as a guide in uniting certain sections of the report. Conditions on board for large scale printing are not very satisfactory and the final printing on Matt paper was carried out at Hobsonville Royal New Zealand Air Force Base.

Laying down the Mosaic.

This was carried out at Hobsonville with the assistance and guidance of the photographic staff who have very considerable survey experience. Certain unimportant patches of coastlines have been faked for the sake of appearance. In such cases the fact is clearly indicated. In this work all concerned at Hobsonville were extremely helpful and their advice was at times invaluable.

SECTION IV. ... REMARKS BY OFFICERS.

LIEUTENANT COMMANDER (N)

Christmas Island

Good anchorage is available outside the lagoon in depths of about 30 fathoms for quite large vessels. Inside the lagoon, good space is available
off

off S.E. side of London for laying moorings for lighters etc., in a depth of 10 - 12 feet with easy access through passage between Cook Islet and the small triangular shoal off London. Piers for the lighters to berth alongside to unload would be easy to construct and of no great length.

Fanning Island.

There is no reliable anchorage - that at Whaler anchorage is unsuitable except for small craft, or larger ones for a short time with the wind in the right direction, and suffers from the disadvantage of being some distance from English harbour. There is no anchorage off the latter.

Small craft drawing up to 18 feet can berth and unload in the entrance to English harbour according to the Pacific Islands Pilot, Volume III., Page 167.

It would normally be possible to load lighters from ships lying under way outside, and berths for the lighters could be found inside the lagoon.

Kingman Reef. No remarks.

Canton Island

No suitable anchorage for any vessel larger than a sloop. Southern entrance could be made available for lighters and ship could load these whilst under way.

Hull Island.

No anchorage. Concur with remarks re loading of lighters from ship, and also with possibility of blasting a channel through reef.

Nuku-Nono

Nuku-Nono.

No anchorage, and when we were there, considerable swell, but possible to load lighters from ship under way.

Minerva Reef.

No anchorage outside. If channel to Northern reef suitably marked, and depths are approximately those shown on chart, quite large steamers could proceed to anchorage inside reef.

LIEUTENANT (T)

It is considered that it would be a simple matter to demolish coral heads such as those at Hull Island.

It was found during a practice at Christmas Island that charges could be placed at a depth of about two fathoms by good swimmers, the use of divers would therefore in all probability prove unnecessary.
