NOMINATION

To the Commonwealth Heritage List

Of the Cocos Catalina JX 435

A wrecksite in the lagoon at the Cocos (Keeling) Islands.

Compiler: *Dr M.McCarthy*
Curator of Maritime Archaeology
Department of Maritime Archaeolog
WA Maritime Museum
Cliff St Fremantle
6160

25/01/2005

With contributions from: Silvano Jung and with the support of Ms Wendy Murray, Government Conservator, Parks Australia & Mr Graeme Henderson, Director Western Australian Maritime Museum.

Report-Department of Maritime Archaeology, Western Australian Museum, No. 252
2005

Part A:
The nomination

Australian Government
Department of the Environment and Heritage

Commonwealth Heritage List

Nomination Form

The Commonwealth Heritage List is a record of places, owned or leased by the Australian Government, that have significant natural, Indigenous or historic heritage values. The values of these places are important and they are protected by federal law under the *Environment Protection and Biodiversity Conservation Act 1999*. Nominating a place to the Commonwealth Heritage List means identifying its Commonwealth Heritage values on this form and providing supporting evidence. If you need help in filling out this form, contact 1800 020 625.

Form checklist

1. **read** the *Nomination Notes* for advice and tips on answering questions in this form.
2. **add** attachments and extra papers where indicated (Note: this material will not be returned).
3. **provide** your details, sign and date the form.

Nominated place details

Q1. What is the name of the place? Cocos Island Catalina JX 435.

Q2. TIP *Give the street address, or, if remote, describe where it is in relation to the nearest town. Include its area and boundaries. Attach a map with the location of the place clearly marked. See the* Nomination Notes *for map requirements.*

Q2a. Where is the place? Address/location: On the seabed in the lagoon at the Cocos (Keeling) Islands centring on 12°, 06', 00". South, and 96° 51' 29" East.

Q2b. Boundary:
The known remains lie within a 1km radius of these co-ordinates.

Q2c. Type of map you have supplied:
Excerpt from British Admiralty Chart BA 2510. Approaches to Cocos or Keeling Island. (Attachment 1 a &b)

Q3. TIP *For information on where to obtain details of who owns or leases a place, contact your local government. See the* Nomination Notes *for ideas.*

Q3a. Which Commonwealth agency owns or leases the place? ~~Agency name~~The Island is Administered by the Commonwealth Government

Q3b. If the Commonwealth leases the place, who owns it? Owner's name (if more than one attach a list):

Address:

State:>

Postcode:

Ph: Fax: Email:

Q3b Are agency(s) and owner(s) (where relevant) aware of the nomination? ~~NO ☐ YES ☐ SOME ARE ☐ (Please list):~~ Yes: The Cocos (Keeling) administration(s) and the Commonwealth Department of Heritage itself are aware that the nomination is proceeding. The nomination is also supported by Parks Australia staff in the Cocos (Keeling) Islands (see Attachment 2)

Q4. Who has an interest in the place? This could include the property's manager, local environment or historical groups, local council, Indigenous people and developers or industry groups. Please provide names and telephone details.

The Island's governing agencies, heritage interests and tourism operators.
Notably
Cocos (Keeling) Islands Shire Council – Mr W. Price CEO Home Island Cocos (Keeling) Islands 6799
Cocos (Keeling) Islands Historical Society West Island Cocos (Keeling) Islands 6799
Cocos (Keeling) Islands Tourism Association P.O. Box 1030 West Is, Cocos (Keeling) Islands 6799.

Glass bottom boat operator:
Mr G. Christie
Po Box 1073 West Island CKI 6799

Dive Charter operator and Chair Cocos (Keeling) Islands Tourism Association
Mr Dieter Gerhard
Cocos Dive PO BOx 1015, West Is, Cocos (Keeling) Islands 6799

Christmas Island 12° 05 59.0
96 51 29.3

Trial Harbour 12° 06 06.1
96 51 15.8

Belly. 12° 06 06.7
96 51 15.3

Skid trial Bank 12° 06 11.7
96 51 16.0

Main Wharf 12° 06 11.7
96 51 12.0

About the importance of the place

Q5. What is its significance?

How would you tell people that this place has heritage importance? For example, why does this place highlight a significant aspect of our heritage?

The Government agencies, tourist bodies and tourist operators and heritage managers in the Cocos (Keeling) Islands all view the remains as part of the cultural heritage of the place, notably in respect of its role as a strategic military base in WWII. In that context they view the remains as an integral part of the educational, recreational and tourist assets at the islands. Little else remains on the islands that attests first-hand to the presence of an allied airstrip, flying boat base and for that matter military establishment. The remains of JX 435 are a tangible reminder of the place the islands once held as a strategic mid-ocean staging point in WWII. As a tangible reminder of the men lost while in this particular aircraft and of all those others lost in wartime service at the islands or en-route the Cocos during the war, the remains are a focus as a 'living' memorial used for public purposes today. They are also a poignant reminder of the sacrifices of all who served in WWII and of the difficulties in navigating across the oceans over half a century ago.
The engines and propellers lie upright on the seabed and by their very size and manifest 'power' both as a machine and as a commemorative object they vividly reflect past times and catastrophic events. (Attachment 3)

Q6. TIP *See the* Nomination Notes *for examples on how criteria might be interpreted.*

Q6. **Which criteria does it meet?** Please try to identify which criteria from the list below apply to the place. In assessing the nomination, the Australian Heritage Council will check the nominated criteria for a place.

The place where JX 435 was lost and the site itself has significant heritage value because

1) it has importance in the course, of Australia and the Cocos Islands cultural history. Criterion a)

2) it has potential to yield information that will contribute to an understanding of Australia and the Cocos Islands cultural history. Criterion c)

3) The remains in the place constitute a rare example of a WWII Flying boat lost while in active service. Criteria b & d)

4) the place has a strong and special association with allied service aviators and their families. For some it is the place where servicemen died in action, for others the place where they were severely injured. For many, notably the families of the deceased the place has become a memorial to lost aviators. To others the remains have a special association with the life and works of the trans-ocean aviators of WWII and their support personnel based in the Cocos (Keeling) islands. This includes some of the Malay people resident there. To all visitors the wreck is (though remains have not been found) both a grave-site and a war memorial. Criteria g) & h).

The Commonwealth Heritage criteria for a place are any or all of the following:

- ☐ **a** – the place has significant heritage value because of the place's importance in the course, or pattern, of Australia's natural or cultural history
- ☐ **b** – the place has significant heritage value because of the place's possession of uncommon, rare or endangered aspects of Australia's natural or cultural history
- ☐ **c** – the place has significant heritage value because of the place's potential to yield information that will contribute to an understanding of Australia's natural or cultural history
- ☐ **d** – the place has significant heritage value because of the place's importance in demonstrating the principal characteristics of:
  - i. a class of Australia's natural or cultural places
  - ii. or a class of Australia's natural or cultural environments
- ☐ **e** – the place has significant heritage value because of the place's importance in exhibiting particular aesthetic characteristics valued by a community or cultural group
- ☐ **f** – the place has significant heritage value because of the place's importance in demonstrating a high degree of creative or technical achievement at a particular period
- ☐ **g** – the place has significant heritage value because of the place's strong or special association with a particular community or cultural group for social, cultural or spiritual reasons
- ☐ **h** – the place has significant heritage value because of the place's special association with the life or works of a person, or group of persons, or importance in Australia's natural or cultural history
- ☐ **i** – the place has significant heritage value because of the place's importance as part of Indigenous tradition

Q7a. TIP *In describing the place, think about its physical aspects and surrounds, its uses by people, aesthetic qualities and any spiritual or cultural associations. You should try to include photographs and a site map or sketch plan if appropriate. See the* Nomination Notes *for details.*

Q7a. How would you describe the place?

Cocos Island Catalina JX 435 is a submerged WWII flying boat wreck that has in recent years proved to be a popular place of visitation for divers in snorkel and SCUBA mode and for tourists conveyed in a glass bottomed boat. Though the human remains appear to have floated away soon after it crashed, JX 435 is also considered to be a grave-site and war memorial, a tangible reminder of the men lost while in service in that aircraft. It is also a memorial to all those aviators lost ex or en-route the Cocos during the war and is a poignant reminder of the sacrifices of all who served in WWII and of the difficulties in navigating across the oceans.

Q7b. What condition is it in? Describe whether the place is intact or if there has there been any damage or disturbance.

The aircraft appears to have inverted and broken up on impact and as the fuselage caught fire the wing and tail plane broke off and appear to have drifted away to sink some distance from the impact site. Cyclones may also have had a subsequent role in disarticulating the main parts wreck. Today the remains appear in 4-6m of water as a recognisable wreckage 'plume' (characteristic of underwater sites where wave action can be a factor). The wreck commences in the north east with heavy materials at the impact (sinking) point. There at 12°06.00'S., 96°51.28.7'E., the two engines complete with propellers, the remains of a machine gun, many gauges and some machinery from the forward section and cockpit, are most prominent. The pilot and co-pilot's seat are particularly striking, lying separated from each other near the two engines. From there c. 300m in a south westerly direction lies the tailplane followed further on by more fuselage-based wreckage including most prominently the midships 'blister's, one set of rudder pedals, the 'hull 'step' and the wing pontoons. The aircraft's wing lies further away at the south-westerly extremity of the site, a distance of some 600 metres from the forward section. Hull and other fragments are visible throughout the plume. Much of it is expected to lie buried in sand or to remain hidden in weed banks. (Attachment 4).

Q8. What is its history? Summarise its origins and development. You may need to attach additional information.

In mid-1945, Cocos (Keeling) islands were base to around 7000 Allied personnel, operating communications stations, gun emplacements, an airstrip and a flying boat base. Apart from conducting aerial operations into enemy-held territory in Java, Singapore and Malaya from the airstrip, for the communications facility, the base is perhaps best noted for its flying boat activities. The lagoon between Direction and Horsburgh Islands (see chart excerpt) became the landing, refuelling and respite for the many very long range wartime crossings between Ceylon (Sri Lanka) Exmouth Gulf and the Swan River (Perth). These crossings were generally effected using long-range PBY Catalina aircraft crewed by a range of allied personnel mainly British, Canadian and Australian. Non-operational personnel, supplies, machinery, mail and other goods were often carried. The Flying boats also carried out operations against enemy bases and shipping. Malay people resident on the islands also provided support as boat crew and in other capacities.

Catalina JX 435 was attached to 240 Squadron RAF based at Red Hills Lake, Madras India. On June 27 1945, while transporting materiel, including heavy crates to the Cocos Islands the pilot attempted a downwind landing in rough seas. The combination of high speed and the seas and swell caused the aircraft to overturn killing seven of the fourteen onboard. Their bodies were never found. Of the other seven all were injured two fatally. (Attachment 5)

With the cessation of hostilities the location of the aircraft soon became lost to living memory and it was not re-found until the late 1980s. Presently only the engines are part of the cultural tourism offering in the islands, the midships section and wing having been recently re-found by Parks Australia staff.

Q9. TIP *We'd like to know about other places that have similar characteristics to the place that you are nominating. For example, these other places might have similar species or rock formations; they might be similar buildings or places with similar histories, traditions or beliefs attached to them. See the* Nomination Notes *for more tips.*

Q9. What other places have similar characteristics? How do these places compare with the place you are nominating?

There are WWII PBY Catalina wrecks amongst other flying boats lying in the waters off Broome, Fremantle and Darwin on the Australian mainland. These have been the subject of a number of studies by Museum staff and by Silvano Jung a recognised leader in submerged aircraft (especially the PBY Catalina type) studies. It is evident from those researches that the Cocos Islands Catalina is unique in that it was the only example lost as a result of a crash. All the others were strafed while at anchor either in Broome and Darwin harbours, or scuttled in deep water off Fremantle at the end of the war in compliance with 'Lend Lease' agreements. Unlike the Broome, Fremantle and Darwin examples, the Cocos Catalina wreck is also unique in that it lies in normally benign, very clear shallow water, and its engines and the wreckage nearby are the object of regular visitation by locals and tourists keen to view an aircraft wreck in a setting characterised by prolific sea life. In contrast, most often the remains at Broome and Darwin are difficult to recognise in the poor visibility and above a seafloor of mud.

Q10. What other information is available on the place? List any articles, books, reports or heritage studies that may provide evidence supporting your nomination. You may also have information from Traditional Owners and Custodians, scientists or heritage specialists. If they have agreed to share their knowledge, please include their contact details.

The Cocos Catalina wreck, the WWII allied base and the most significant events on the sea, in the air and at the base appear mentioned in most island histories. The then newly-found wreck featured in a 1978 article written and illustrated by Richard Matthews (attached). This appeared in Sport Diving magazine. In an otherwise very informative piece, the wreck was incorrectly identified as JX 334, partly as a result of a previous official error. (Attachment 6) While mentioned only briefly in these works, the site will appear featured in a report by the Department of Maritime Archaeology at the WA Maritime Museum to be entitled 'Maritime Sites of the Christmas and Cocos Islands (in prep) and will also feature as a comparative study in Silvano Jung's doctorate on the WWII Catalina wrecks of Broome (in prep). In those two works detailed descriptions of the remains will appear. Attachment 7 is a recent article on the subject of the 'Aircraft as an archaeological site' (McCarthy, 2004). This attests to the recently-acknowledged cultural and historical value of submerged aircraft sites, a realisation that only recently led to the declaration of all 15 sites in Broome under the Heritage of Western Australia Act 1990 (Attachment 8). The deep water wrecks off Fremantle are yet to be found (McCarthy, 1997) and a protection mechanism for the Darwin wrecks is still being sought (Jung, 2000). The JX 435 wreck is also mentioned in a recent work on maritime archaeology in Australia as a significant site awaiting protection (McCarthy, in prep). Indeed it could be observed that the protection of submerged aircraft is a heritage management phenomenon little different from the first of the historic shipwrecks acts.

Considerations

Q11. Are there sensitive issues associated with the place? These may be issues that need to be kept out of the public eye such as matters relating to sacred or religious sites, or the location of rare fossils, plants or fragile places.

NO ☐ YES ☐

Should the site become registered as an historic site under the Commonwealth legislation, it will have sufficient protection to allow those parts not yet being accessed to be better presented to the local community and to visiting divers. Underwater interpretive material in the form of interpretive plinths, and a site map will be prepared to cater for those interested in viewing the entire site (subject to funding). These will serve to welcome visitors and to stress the heritage values of the site. This approach will seek to engender a positive and conservation-minded approach by the divers. Until that time the location of the fuselage remains and the wing will be kept confidential.

If you answer yes, we will contact you to discuss the issues.

Your details are needed in case we require more information on the nominated place. Your identity is protected under the Federal Privacy Act 1988 *and will not be divulged without your consent or as allowed for under that Act.*

Are you nominating a place on behalf of an organisation?

NO ☐ YES ☐ Yes both individual and organisational. Dr McCarthy, as leader of the JX 435 inspection team nominates on behalf of the Department of Maritime Archaeology at the Western Australian Maritime Museum, institutional leaders in underwater aviation archaeology in the region. Mr Jung nominates as a member of the team and as the acknowledged expert in respect of the Catalina type (the subject of his Masters and Ph.D studies), Mr Graeme Henderson Director of the Western Australian Maritime Museum, a member (with McCarthy, Jung and Parks Australia staff) of the recent inspection team, at the address below, also supports his Department's application. His support is doubly of value having been a leading force in the development of the ICOMOS International Committee on the Underwater Cultural Heritage, which he chaired and as a former Chair of the International Committee of Maritime Museums. Ms Wendy Murray Government Conservator, Parks Australia Cocos (Keeling) Islands also supports the nomination. (Attachment 2 a&b)

If you answered NO, fill in only Details Table One. If you answered YES, fill in only Details Table Two

Details Table One

Title: >Mr First name: Silvano Family name: Jung

Address: Ph. D Candidate, School of Creative Arts & Humanities

Charles Darwin University. Darwin. State:>NT Postcode: 0909

Tel: 89466854 Fax: 89466977 Email: silvano.jung@cdu.edu.au

Details Table Two

Title: >Dr First name: Michael Family name: McCarthy

Organisation name: Department of Maritime Archaeology

Address: Western Australian Maritime Museum

Cliff St Fremantle State:>WA Postcode: 6160

Tel: 61-08 94318436 Fax: 9 4318489 Email: michael.mccarthy@museum.wa.gov.au

Final checklist

Before signing and dating your nomination form, please make sure that you have:

☐ attached and labelled the location map and/or site plan

☐ attached and labelled the optional photographs and supporting evidence that you wish to include.

Signature of nominator _____ Date _____

Send the completed form and attachments by mail to:

The Nominations Manager
Heritage Division
Department of the Environment and Heritage
GPO Box 787
CANBERRA ACT 2601

Part B:
Attachments 1-9

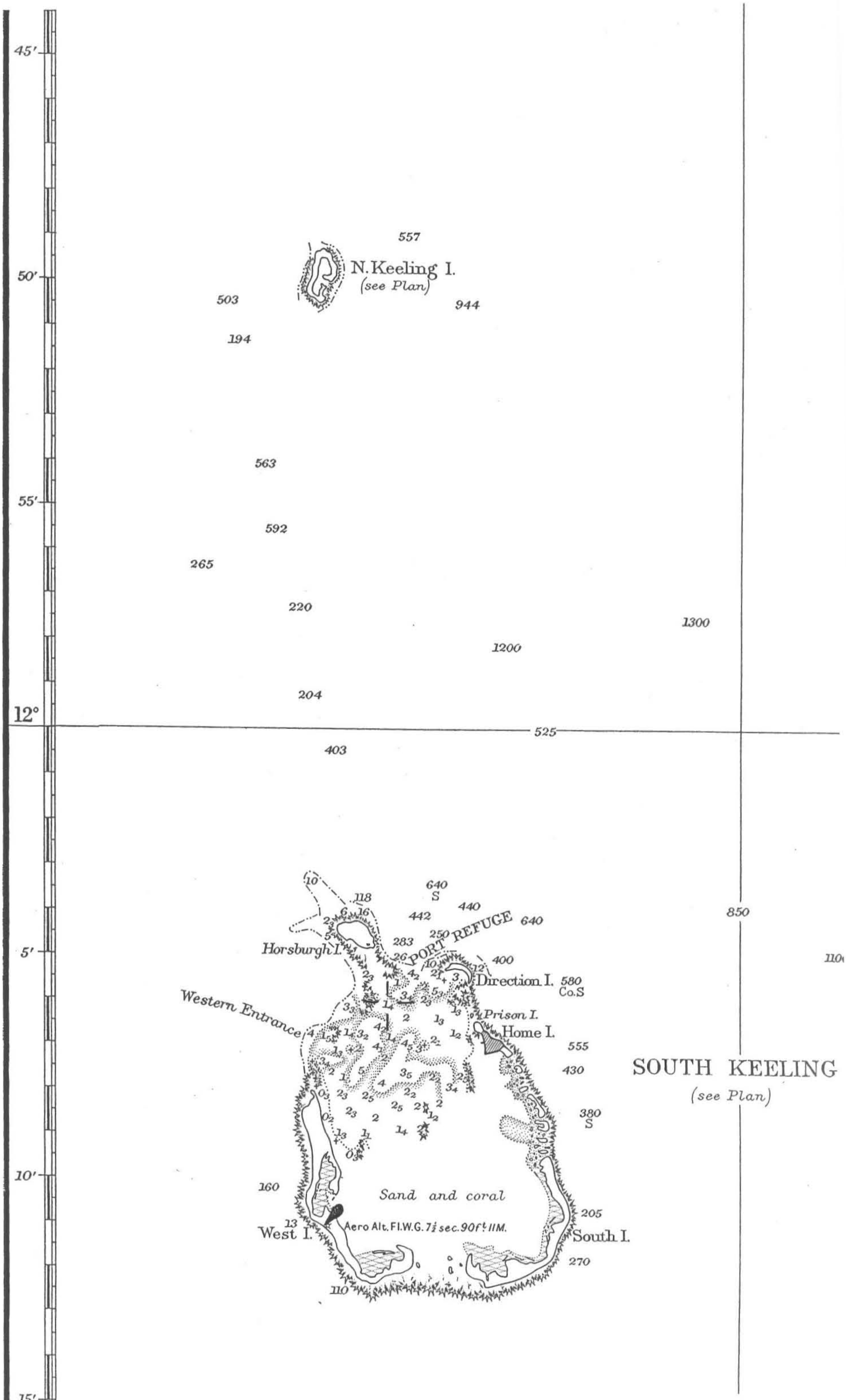
ATTACHMENT 1

Chart Excerpt locating JX 435

From: British Admiralty Chart BA 2510. Approaches to Cocos or Keeling Island & South Keeling

Notes:
Chart 1 is of the Cocos (Keeling) Islands as a group.
Chart 2 is of the northern end of the South Keeling group.

The engine/cockpit area of the JX 435 wreck lie at the north eastern co-ordinate and the wing at the south western location (both marked with a cross). The remaining known wreckage lies on a line between the two.



45′
50′
55′
12°
5′
10′
15′
557
N. Keeling I.
(see Plan)
503
944
194
563
592
265
220
1300
1200
204
525
403
640
S
118
440
442
640
850
PORT REFUGE
Horsburgh I.
283
400
Direction I.
580
Co.S
Western Entrance
Prison I.
Home I.
555
430
SOUTH KEELING
(see Plan)
380
S
160
Sand and coral
205
West I.
Aero Alt. Fl.W.G. 7½ sec. 90ft 11M.
South I.
270
110

Tidal Information and Chart Datum

Place	Height above datum of soundings					
	Average Heights				Heights at Springs near the Solstices	
	High Water		Low Water		High Water	Low Water
	Mean Higher	Mean Lower	Mean Lower	Mean Higher	Mean Higher	Mean Lower
Port Refuge	3·6 feet	2·8 feet	1·3 feet	1·4 feet	4·3 feet	0·9 feet

SOUTH KEELING

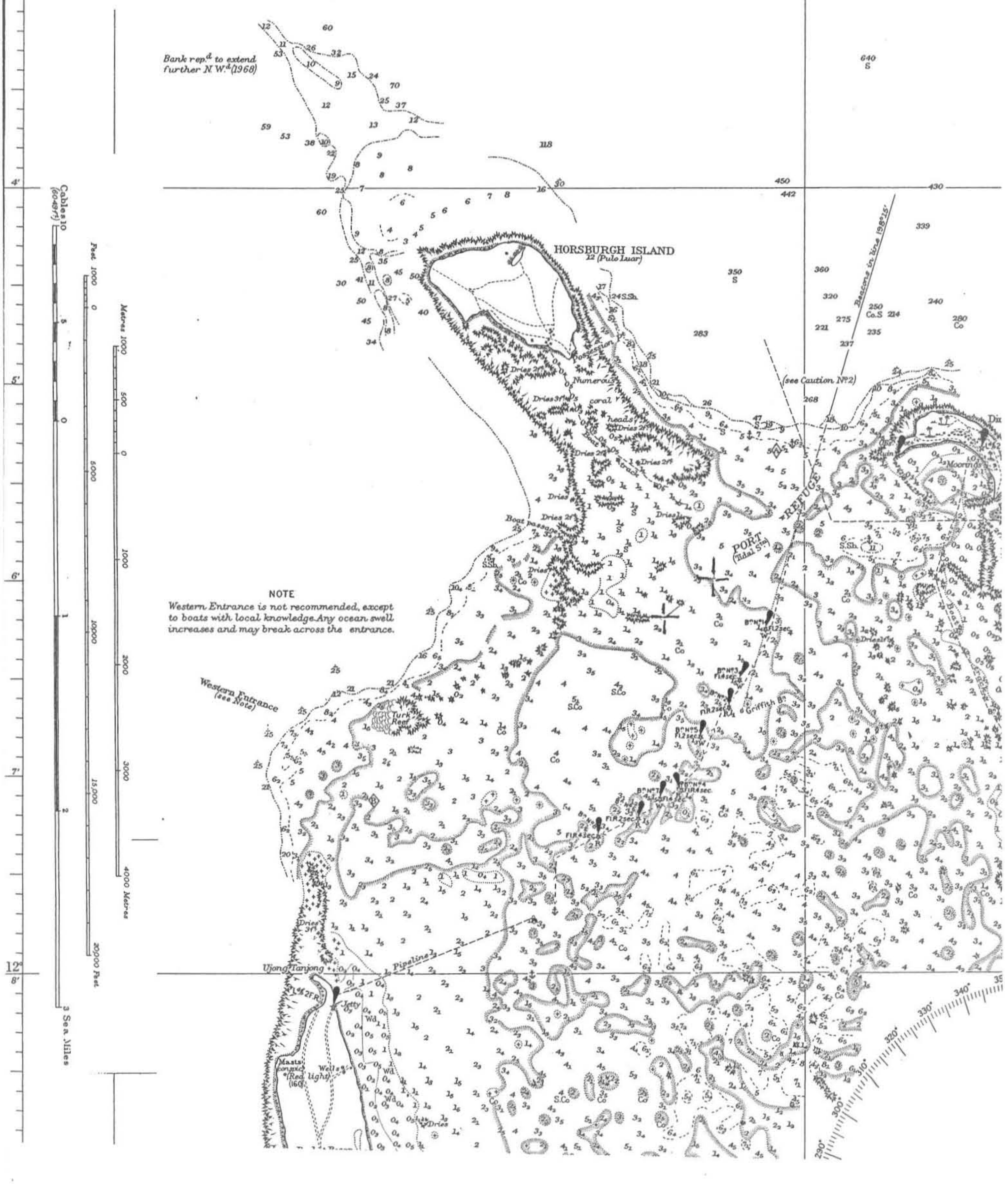
SURVEYED BY LIEUT-COMMANDER E.E. CROOME R.N, MARCH, 1944.
Entrances re-surveyed by Lieut. Commander C. J Wood R.N, Feb-April, 1945.
With additions and corrections to 1962.
Observation Spot + Lat. 12°05'18"S., Long. 96°52'37"E.

SOUNDINGS IN FATHOMS
(Under Eleven in Fathoms and Feet)

Natural Scale $\frac{1}{37,500}$
Projection – Gnomonic

CAUTIONS

1. *Numerous coral heads at all depths have been found (1960) and Mariners are advised not to enter the lagoon without local knowledge.*
2. *Vessels should not anchor to eastward and northward of the pecked line owing to the existence of cables.*
3. *Buoys are not to be relied on (1946).*



ATTACHMENT 2

1) *Letter from Ms Wendy Murray, Government Conservator, Parks Australia in support of the nomination*
2) *Letter from Mr Graeme Henderson, Director, Western Australian Maritime Museum, in support of the nomination*

To Whom It May Concern:

Parks Australia on the Cocos (Keeling) Islands would like to express their support for the nomination of the Catalina JX435 for heritage listing.

The crash had a significant impact on the people living here at the time: partly because of the nature of the crash, partly due to the involvement of local people in the rescue work and partly due to the fact that 7 of the bodies were never recovered.

Cocos Island was also bombed during World War II and as such the local community has experienced directly the loss caused by war.

The wreck is an important part of the cultural heritage of the islands and also has value as an attraction for snorkellers, SCUBA divers and people on glass bottom boat tours.

Listing the site will convey the value of the wreckage to locals and visitors alike. This will foster a positive and conservation-minded approach to Cocos heritage sites.

Yours sincerely

WM

Wendy Murray
Government Conservator
Cocos (Keeling) Islands

14.1.05

PARKS AUSTRALIA NORTH

GPO Box 1260
Darwin NT 0801
Tel (08) 8920 1300
Fax (08) 8920 1315

Kakadu National Park
PO Box 71
Jabiru NT 0886
Tel: (08) 8938 1100
Fax: (08) 8938 1115

Uluru - Kata Tjuta National Park
PO Box 119
Yulara NT 0872
Tel: (08) 8956 2299
Fax: (08) 8956 2064

Christmas Island
PO Box 867
Christmas Island
Indian Ocean 6798
Tel: (08) 9164 8700
Fax: (08) 9164 8755

Cocos (Keeling) Islands
Government Conservator
PO Box 1043
Cocos (Keeling) Islands
Indian Ocean 6799
Tel: (08) 9162 6678
Fax: (08) 9162 6680
Email: wendy.murray @deh.gov.au

Australian Government
Director of National Parks

WESTERN AUSTRALIAN

museum

MARITIME

Ref: MA-239/81 MMcM:maw
Date: 25 January 2005

DIRECTORATE OFFICE
Tel (08) 9431 8456
Fax (08) 9431 8492
Email graeme.henderson@museum.wa.gov.au
ABN 95249517733

The Nominations Manager
Heritage Division
Department of the Environment and Heritage
GPO 787
CANBERRA ACT 2601

Dear Sir

Nomination of PBY Catalina wreck JX 435 Cosos (Keeling) Islands

I am writing in support of the nomination to the Commonwealth Heritage List of the WWII PBY Catalina Flying Boat wreck at the Cocos Islands. Presently this highly significant site, one of the few tangible reminders of the significant role played by the Cocos (Keeling) Islands as a communications facility and flying boat base, remains unprotected. It is however increasingly the object of visitation by recreational divers and in that vein has become one of the prime underwater attractions in the region. Heritage managers and local tourist bodies in the islands all seek to see these remains preserved, not just for their intrinsic heritage values, but also as rare and wonderfully-accessible educational, recreational and tourist assets.

Aware of recent moves throughout Australia and elsewhere that recognise the submerged aircraft as a bona fide archaeological site as well as living monuments to those that served in them, or who provided support to them and their crews, I commend this nomination to you as a an initiative consistent with ICOMOS/ICUCH ideals. It is also consistent with the ideals of the 'underwater display case' and living monument, which while serving to commemorate the fallen and those who have made great sacrifices in the defence of the nation and the region, also serves to present the heritage and to educate the viewer accordingly.

I understand that, subject to the nomination proceeding in a satisfactory manner, it is hoped to better present the site with interpretive materials and site markers.

Recently I dived on the wreck with my staff and can attest to the beauty of the monument and power that it conveys to the viewer.

Yours sincerely

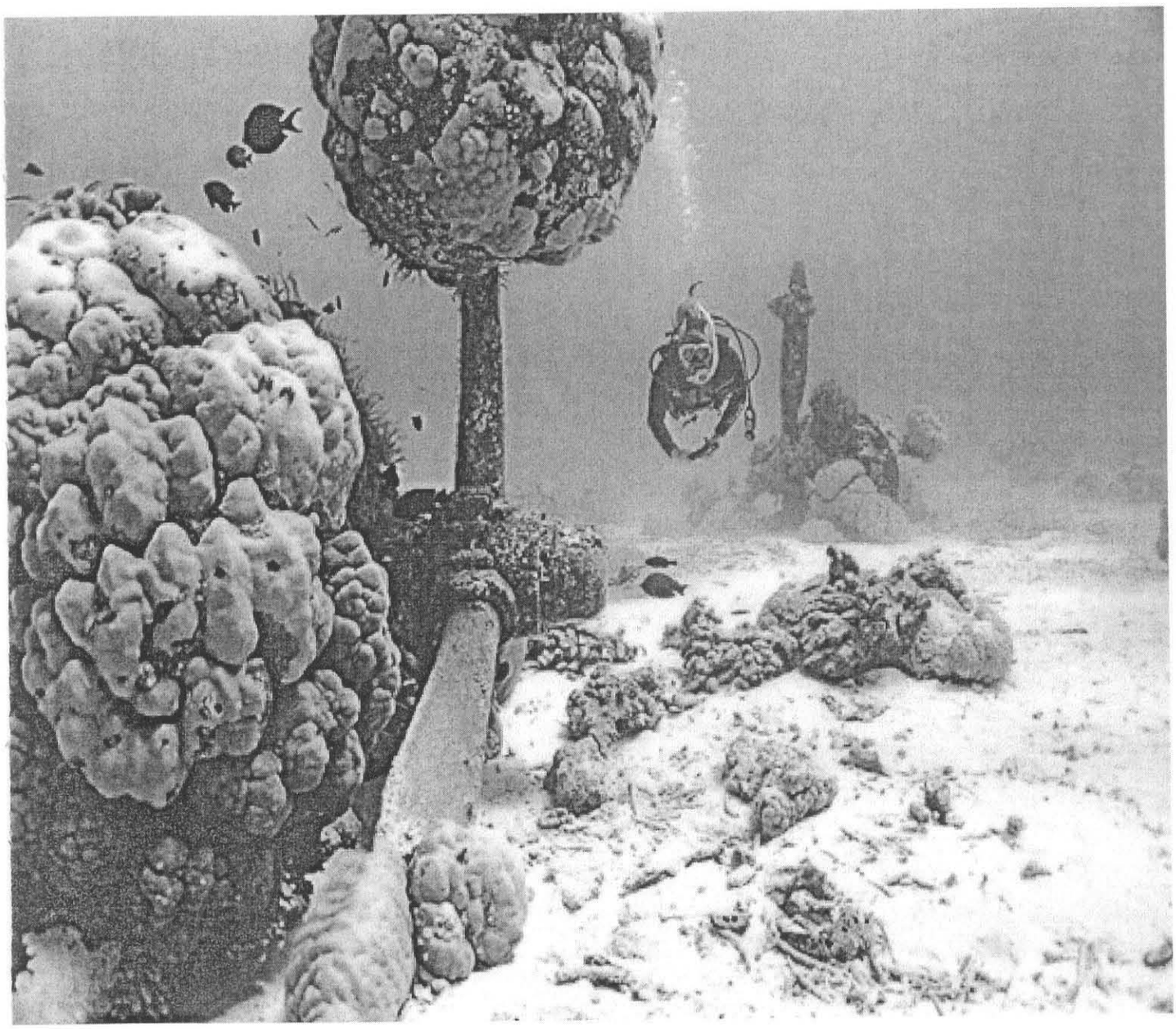
GRAEME HENDERSON Cit WA
Director

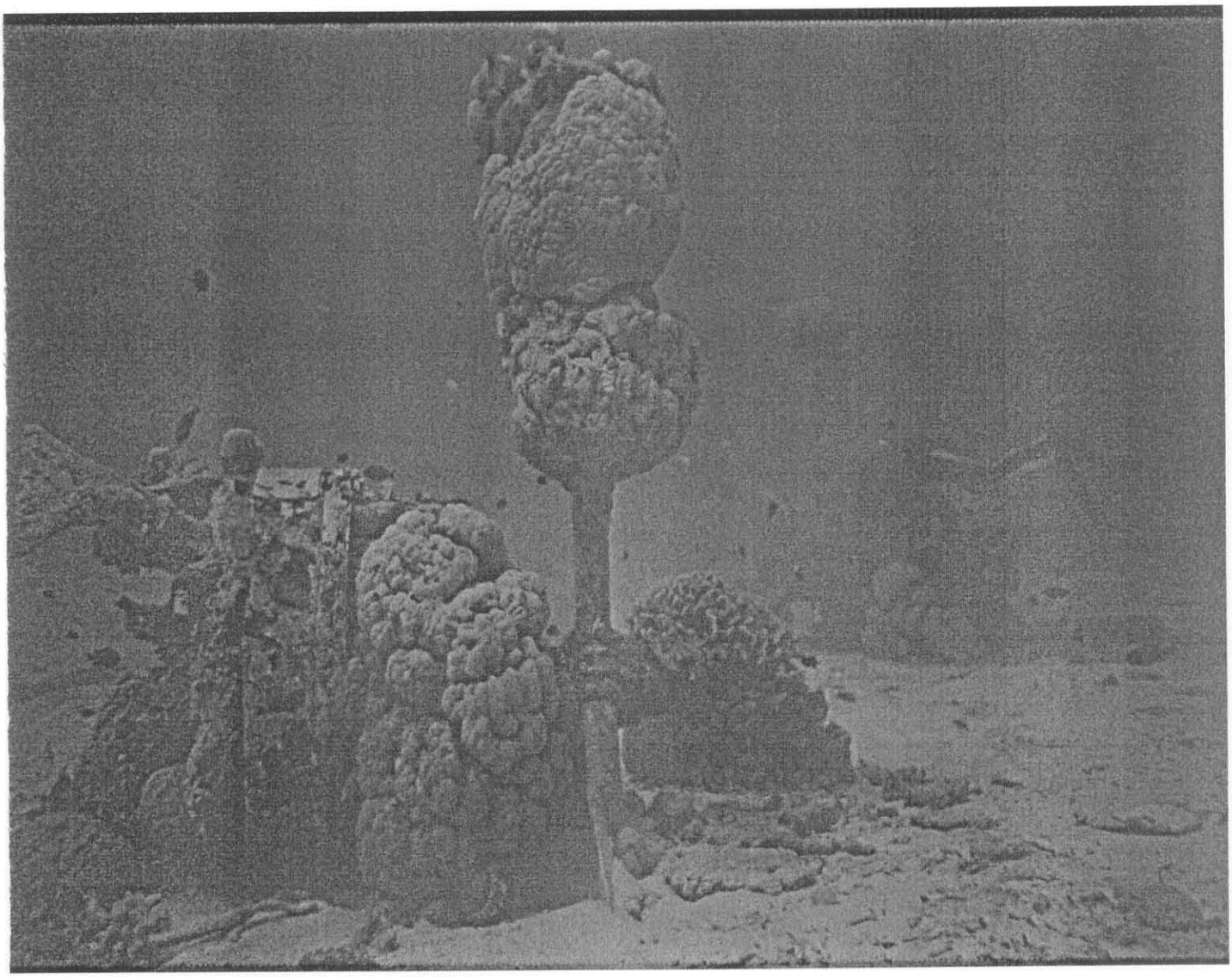
ATTACHMENT 3

The JX 435 Propellers

Photos by Wendy Murray & Silvano Jung.

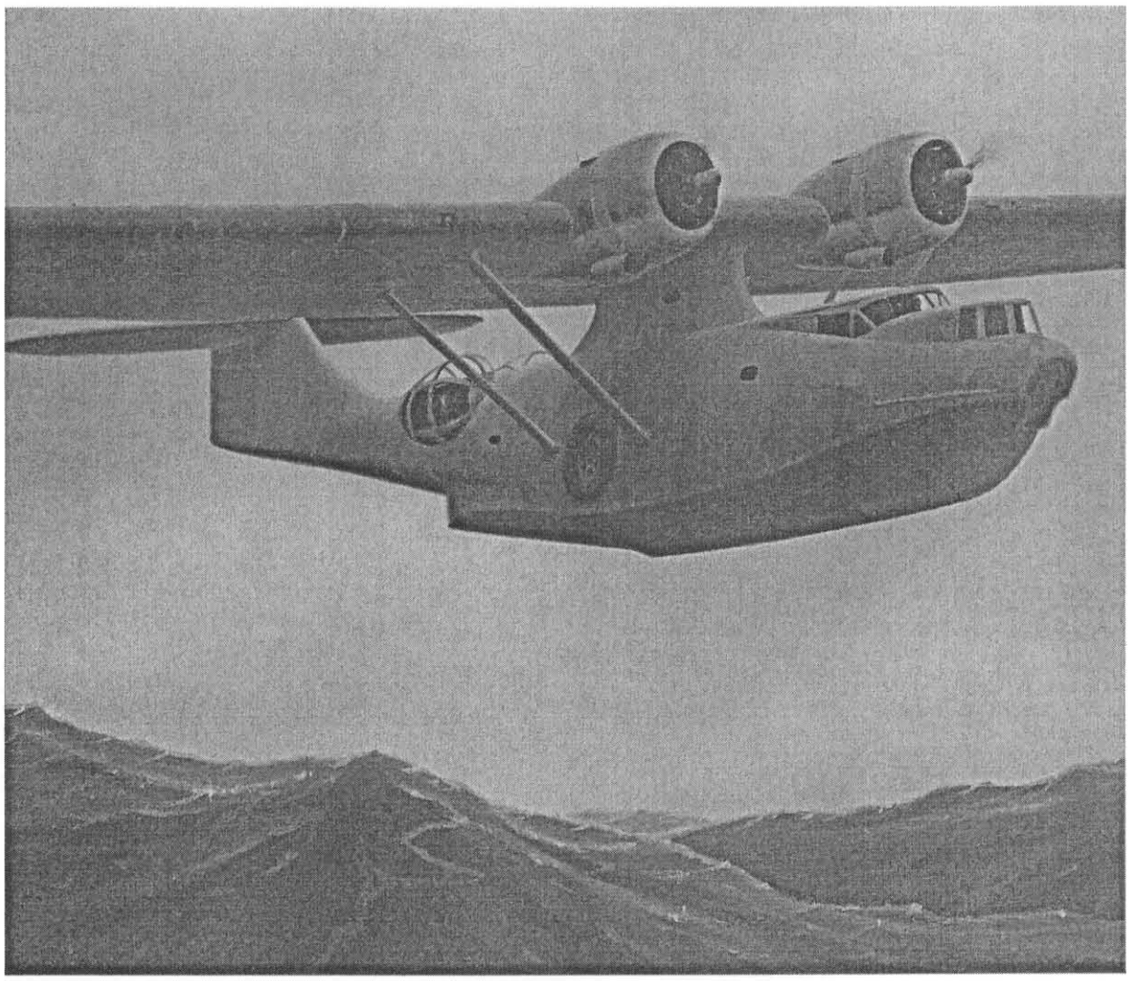
Showing also the prolific marine growth on the site. The divers also provide some indication of their size.





ATTACHMENT 4

The JX 435: Plans and images of the type
PBY in flight: After Creed, 1985; Hendrie, 1988.
Plan: Silvano Jung
Wreckage images: Wendy Murray, Silvano Jung, Robert Thorn.
Composition M. McCarthy.

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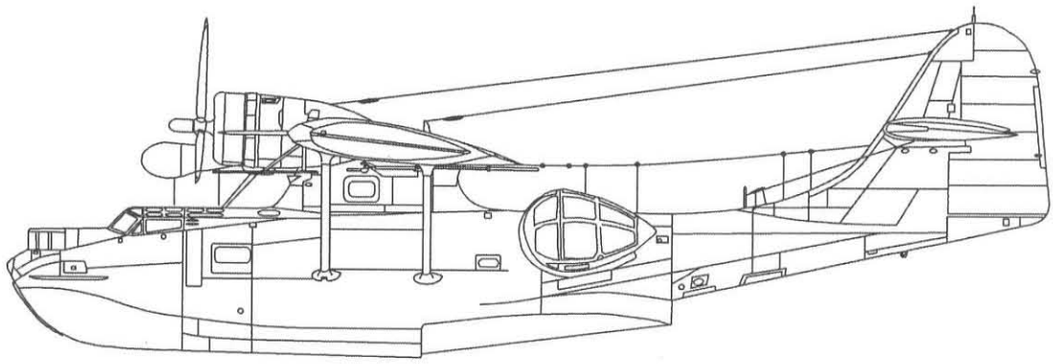
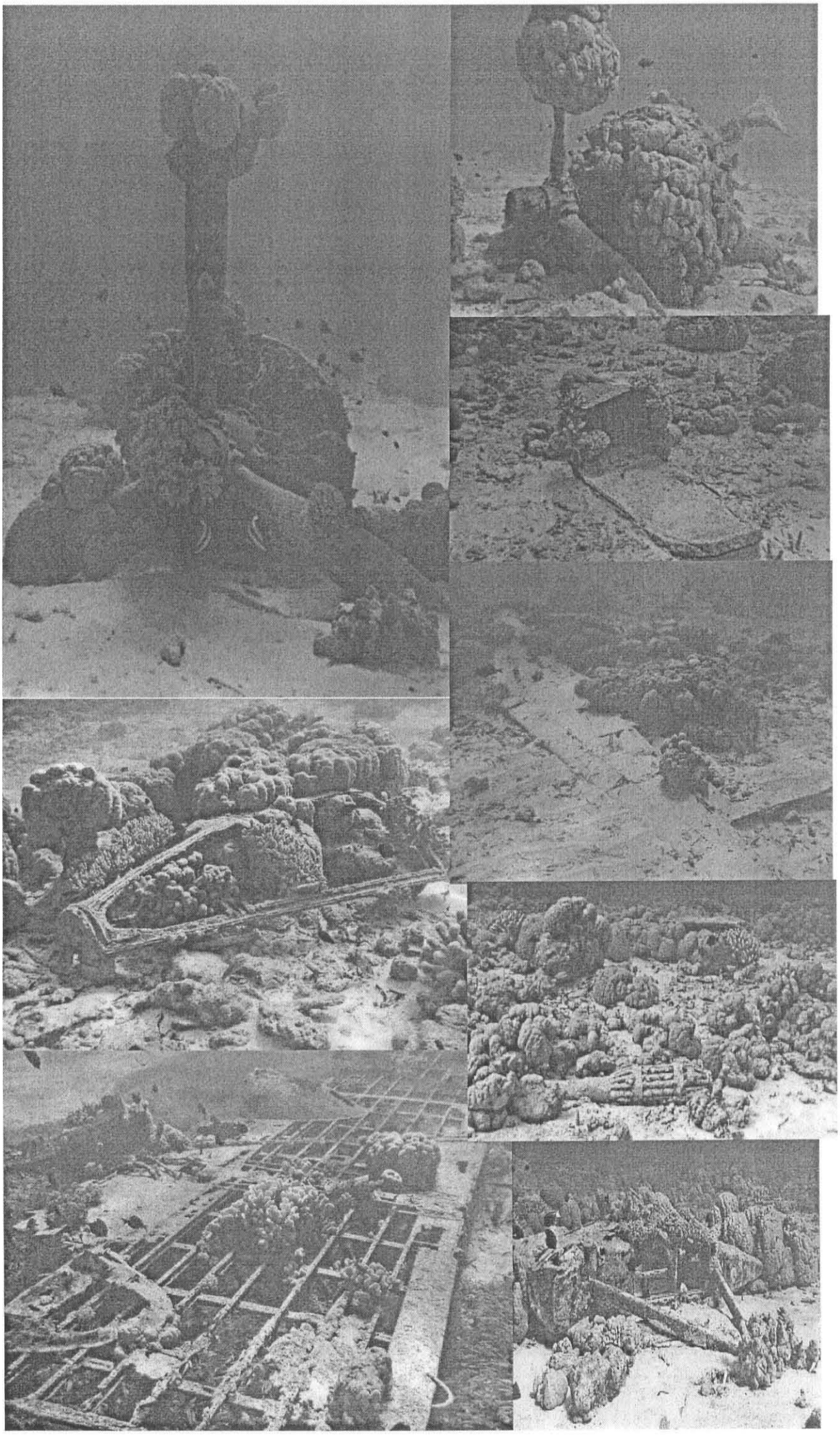




ATTACHMENT 5

Archival data re the loss of JX 435
Compiled by Silvano Jung

1) Crew and passenger details, with photographs courtesy of P. Collier.
2) A family commemorative plaque
3) A transcript of contemporary accounts (PRO Kew).
4) An account of the loss of JX 435 by WO Jim Mitchell (Gunner on JX 435)
5) The air-sea rescue crew

APPENDIX 1:

TO THE MEMORY OF THE RAF AIRMEN WHO DIED IN CRASH OF JX435, 27 JUNE 1945

Serial Number	Rank	Name	Age	Source	Burial	NEXT OF KIN
240 Squadron						
1294159	F/Sgt Wireless Operator	E.W.G. Denmark (Edward William George)	24	Singapore Col 450	Singapore Memorial (No Known Grave)	**Next of Kin (1945)** Son of Walter George and Florence Maud Denmark, Mile Cross, Norwich, England. **Next of Kin (1995)** Unknown
1320699	W/O Pilot	E.J. Freeman (Eric John)	23	Singapore Col 448	Singapore Memorial (No Known Grave)	**Next of Kin (1945)** Son of William and Mary Freeman. Husband of Beatrice Nora Freeman. Cambridge, ENGLAND **Next of Kin (1995)** Unknown
1585079	F/Sgt	E.G. Spearing (Eric George)	?	Singapore Col 450	Singapore Memorial (No Known Grave)	**Next of Kin (1945)** Son of George and Florence Spearing, Husband of Christina McGowan Spearing of Yeovil, Somerset, ENGLAND. **Next of Kin** (1995) Unknown
1581676	F/Sgt Navigator	D.J.J. Paramore (David James John)	22	Singapore Col 450	Singapore Memorial (No Known Grave)	**Next of Kin (1945)** Son of Fredrick B. and G.E. Paramore. Harborne, Birmingham, ENGLAND. **Next of Kin** (1995) Unknown
J/95597	P/O RCAF Pilot	F.A. Marshall (Francis Arthur)	23	Singapore Col 457	Singapore Memorial (No Known Grave)	**Next of Kin (1945)** Son of F.A. and Lucy H. Marshall of White Rock, British Columbia, Canada **Next of Kin** (1995) Mrs Irene Allan (Sister) 2736 Cheyenne Ave, Vancouver B.C. CANADA
982448	F/Sgt	Geoff Sims (Geoffrey)	?	Kranji Singapore	Direction Island June 1945. Reburied Kranji Cemetery Singapore. Plot 12 – Row C – Grave 11. 30/5/46	**Next of Kin (1945)** Unknown **Next of Kin (1995)** Unknown Note: died 27 June in hospital as a result of injuries

1080445	F/Sgt Wireless Operator/Air Gunner	Edward Benn	24	Kranji Singapore	Direction Island June 1945. Reburied Kranji Cemetery Singapore. Plot 12 – Row C – Grave 6. 30/5/46	**Next of Kin (1945)** Son of F. and Margaret Benn of West Hartlepool, Co Durham, ENGLAND. **Next of Kin (1995)** Unknown Note: died 28 June in hospital as a result of injuries
684 Squadron						
1866566	L.A.C. Photographic Technician	E.H.J. Butler (Eric Henry John)	?	Singapore Col 453	Singapore Memorial (No Known Grave)	**Next of Kin (1945)** Son of Henry Thomas and Gladys Butler of Northfleet, Gravesend, Kent, ENGLAND. **Next of Kin (1995)** Unknown
1199771	Cpl Fitter 2E	F. Howorth	24	Singapore Col 452	Singapore Memorial (No Known Grave)	**Next of Kin (1945)** Son of Harold and Edith Howorth of Elworth, Cheshire, England **Next of Kin (1995)** Unknown
1728938	L.A.C.	W.J. Liverton	?	?	PRO Kew	**Next of Kin (1945)** Unknown **Next of Kin (1995)** Unknown Note: seriously injured (Flown back to Ceylon – death/survival from injuries unknown)
Survivors						
Peter Collett (passenger)						
Bob Short (crew)						
Jim Mitchell (crew)						

Collier family photographs, each with some of JX 435 complement
(Photographer unknown).

a) L to R (Back) Bob Short, Johnny Freeman, Bill Mitchell and Dick Pitwell, (Front) Ted Denmark, Eric Spearing, Eddie Benn.

Personal note from Mr P. Collier, nephew of E. Denmark. .'You'll note that most of them have pipes, this is because my Uncle Ted was a pipe smoker and decided that the rest of the crew should be also!'

b) L to R. (Back) Pitwell, Mitchell, Short, Benn.
(Front) Denmark, Carlos, Freeman, Marshall, Spearing

c) L to R: Pitwell, Spearing, Paramore, Short

APPENDIX 2:

TO THE MEMORY OF

P/O Francis Arthur Marshall (RCAF)

MY DEARLY LOVED ONLY
BROTHER
WHO WAS KILLED ON 27 June 1945
CATALINA JX435 CRASH AT COCOS

REMEMBERED WITH DEEP AFFECTION
JUNE 1995
MY HANDSOME AND COURAGEOUS
YOUNG
AIRMAN

YOU STILL REMAIN IN THE HEARTS OF
OUR
FAMILY

MAY YOU CONTINUE TO REMAIN IN
PEACE

IRENE ALLEN
VANCOUVER
B.C. CANADA

(Cocos (Keeling) Islands Museum)

APPENDIX 3: Accounts of Loss (A)

Extracts from Operational Record Books supplied by the Public Records Office, Kew

"Five aircraft have been used this month to ferry freight from Calcutta to the Cocos Islands via Koggala, a most interesting departure from a run or Met. flights. To W/O Emberton fell the distinction of being the first of this squadron's captains to take an aircraft to these Islands. The trips involved approximately 16 hours flying through the night from Kogalia [sic] and called for accurate navigation especially as on some occasions the weather was far from good. The use of Loran was a great help, but no charts were available for the more distant part of the flight. It is interesting to note however that the signals were received as far south as 130 S"

Compiled by F/O D.N. Dalton

684 Squadron

The detachment arrived at COCOS ISLANDS from ALIPORE during the last few days of June. Four Catalinas of 240 Squadron were laid on for the transport of ground staff and equipment – the last of which arrived on the 28th. June. The third Catalina 240/B crashed on landing at COCOS – turning over and catching fire. 1199771 Cpl F. Howarth [sic] and 1866566 LAC E.H.J. Butler were killed and 1634903 LAC P.H. Collett and 1728928 LAC W.J. Liverton injured – the later seriously. This accident incurred a serious handicap on the activities of the Detachment as, not only were the original servicing personnel reduced to the barest minimum but valuable spares and equipment were also lost. The Detachment was virtually completed as an operational unit by the arrival on June 29th of the four Mosquito Mk. XXXIVs (Cocos (Keeling) Islands Museum).

APPENDIX 4: Accounts of Loss (B)

Warrant Officer Jim Mitchell
(Air Gunner)

Jim Mitchell was born in 1923 in the small mining village of Trabbock in Ayrshire, and was educated at Stair Public School which he left at the age of 14 years. His father and brothers were in the mining industry and two days later after leaving school Jim followed in their footsteps and started work as a belt operator in Mossblown Colliery.

He eventually realised that this mining work was not for him, but unfortunately at that time it was a reserved occupation.

When WWII started Jim was enthusiastically drawn to flying and later when colliery employees were allowed to join the Armed Forces Jim did not hesitate and volunteered for aircrew duties with the RAF and enlisted as an Air Gunner. This was in 1943.

He did his square bashing at Bridgenorth, and then went to Air Gunnery School at Pembrey, flying in Ansons. He was then posted to O.T.U. at Lough Neagh, in Northern Ireland, where he crewed up, flying Catalinas in Coastal Command. From there he and his crew were posted to Oban for further training and were also engaged in anti-submarine patrols and meteorology flights for about three months.

They were then posted to No.240 Squadron at Red Hills Lake, Madras, India, again carrying out anti-submarine patrols and other Maritime duties. he [sic] served his RAF career in this area until he was demobbed in December 1947 at Warton, Lancashire, as a Warrant Officer.

After the war, staying in the same area he joined the Bolton Fire Brigade in 1948, and in 1966, transferred to the South West Scotland Fire Brigade, which is now Dumfries and Galloway.

He retired in 1973 and started business on his own account in a Fire Protection Company, being engaged in the sale and maintenance of Fire Fighting equipment, finally retiring in 1988.

Jim is married and lists his hobbies as fishing and bowls. (Passed away 2003?)

An Unhappy Birthday

I was one of those Air Gunners who had a quiet and safe war flying in Catalinas of Coastal Command.

Most of my operations were spent looking at white horses in the hope of seeing a U-boat, but I was always disappointed. Then came the change when my Squadron, No. 240, stationed at Red Hills Lake, Madras, in India, was reformed as a Special Duties Squadron.

In June 1945, we were on Strike Duty, and told we had to pack our kit and set off to Calcutta. The instructions were, pack as though in transit, as you may be away for some time. As Rigger/Air Gunner. I was warned at the briefing to be careful when mooring up, as the River Hooghly was a fast flowing river, and to expect dead bodies floating past. I was led to believe that this river had some religious significance, and was the burial ground for some sect.

After an early morning take-off, we alighted on the Hooghly Estuary, and later after a meal in the camp at Bally, the aircraft was loaded with a large wooden box, guarded by two S.P's who

remained on the aircraft until take-off. From then on high security was very much in evidence and the following morning we took off for Trincomalee, in then Ceylon, which was approximately 12 hours flying time away. On landing there the whole crew were escorted to Flying Control, here we ate and slept until the following morning, 26th June 1945.

At briefing, which was very simple, our Skipper, Johnny Freeman, was given a sealed envelope and told to open it when airborne. On opening the envelope it was learned that we were going to the Cocos Islands. I don't think any of the crew had heard of them, but on a makeshift map we saw that they did exist -lying midway between Ceylon and Australia, a journey of some 1,600 miles. Our navigator could then transfer the islands' position onto his plotting charts. I was, until then, surprised at the abundance of goodies we had received for flying rations, and I was glad of them, except for the snag that I had to prepare them. So for the rest of the day my two primus stoves were busy.

The trip was uneventful, and at 00.01 hours over the intercom came a chorus of "Happy Birthday, Jock", 27th June, but no whisky bottles. Shame!!

At approximately 11.00 hours I was up front looking into space when I sighted four little dots on the horizon, which I took to be ships, but eventually we found them to be a small group of islands, yes, the Cocos Islands.

Our navigator was congratulated by every member of the crew for a marvelous [sic] piece of navigation, and we prepared for landing. There was no Flying Control and no flare path just a ship lying stem to anchor, and it did look odd seeing smoke blowing over the sharp end, and after a few flashes on the Aldis lamp we got permission to land.

On our approach, the second pilot pointed out, over the intercom, that we were landing down wind and the Skipper replied "Yes, I know". Now being an Air Gunner I knew nothing about driving, but I knew enough to get a little worried. I was glad that my landing station was in the blister and not up front, so I sat with my back to the bulkhead with my leg jammed on the gun turret and my Mae West buttoned up. It was worth the trouble, for after the first bounce we dropped like a brick, nose first and then overturned - you pilots must be saying 'I am not surprised', why the hell he continued with the landing no one will ever know.

I must have been knocked out for a few seconds; when I looked up front all was black, and when I looked backwards I saw we were on fire. I tried to open the blister, but I couldn't, it was then that I realised we were upside down and sinking. I managed to squeeze the blister open a few inches, but my Mac West was too bulky, and I had to take it off to get out. There were six of us in the drink and no dinghy, but luckily the Air Rescue boat was soon alongside and we were picked up and taken to a so-called hospital, which was a big tent with some beds, sitting on the sand.

With Bob Short, our Flight Mechanic, the two of us were the only ones to survive; the others were either dead on arrival at the hospital or died the next day. The remaining five crew members, including the pilot, died in the crash.

I only wished I could have found out what was in that wooden box, but the story goes that it was currency in rupees and cents, because on the islands for many weeks there was no change, and if you went to the NAAFI for a cup of tea, your change was in razor blades, no kidding, razor blades were a form of currency, so when you had a shave, you took the blade out, cleaned it, put it back in the carefully preserved packet, and used it to buy your next cup of tea.

While in hospital, Bob and I were visited by Lady Park, and Bob showed some sign of nervous tension, but was relieved when Lady Park admitted that she had blue hair! It put our

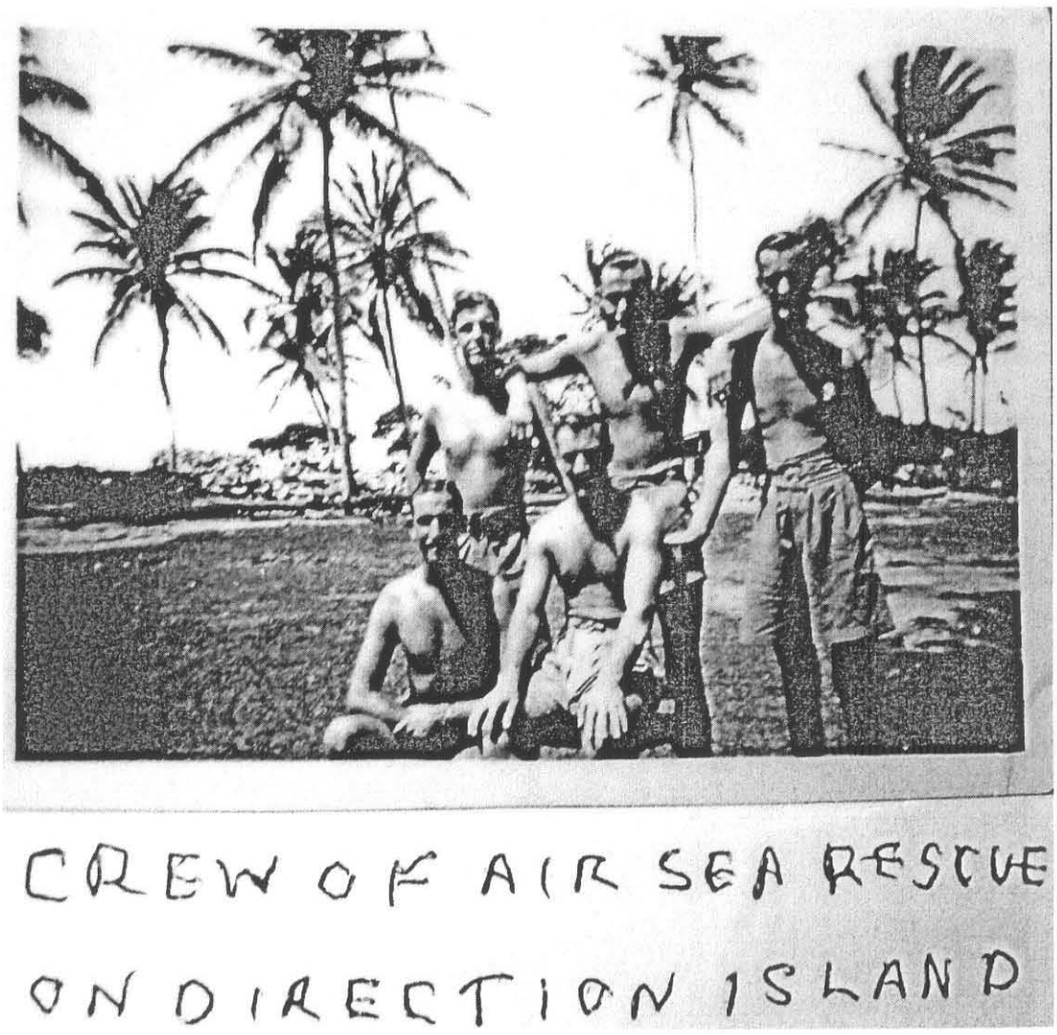
minds at rest. We also had a visit from Gracie Fields, who called the Islands, the Shangri-La of the RAF, but we didn't agree with her.

It was sad for me to think that after all the long flying hours and discomfort, it was fruitless. The wooden box was never recovered.

Dumfries Jim Mitchell (Dumfries & Galloway Aircrew Association 1993:31-33)

Reference:
Dumfries & Galloway Aircrew Association. 1993. *Valiant Endeavours: personal experiences recalled by members of the Dumfries & Galloway Branch of the Aircrew Association*. GC Book Publishers Ltd, Scotland.

APPENDIX 5: Air Sea Rescue crew



Bill Williams, Jim Whiting, Steve Allsford? (Photographer unknown, n.d. Cocos (Keeling) Islands Museum).

ATTACHMENT 6

Popular article written on the occasion of the re-location of the JX 435 Engines

Right:
Lion fish were found resting in the cavity beneath the hub-spinner of this Pratt & Whitney R-1830 Catalina engine.

Far right:
What appears to be an engine exhaust was found 350 metres from the engines, near the tail-plane wreckage.

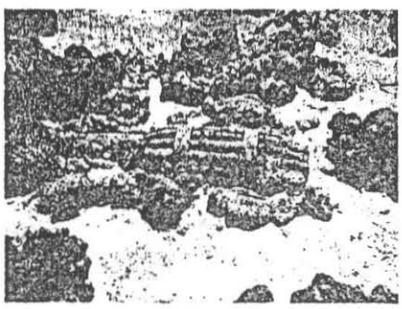
Finding the JX334

Richard Mathews:

Around us in a horse-shoe lay 25 of the 27 coral atolls which make up the Cocos (Keeling) Islands, forming a natural barrier between the Indian Ocean swells and the placid inner lagoon. We were having no luck in finding the engines Gavin had discovered. I asked Helmut Abt, newly-elected President of the Dive Club and my diving buddy, to stop the boat. I donned snorkelling gear, Helmut threw out a line, and I hopped over the side. He then towed me around the area we believed the engine to be. Below me in 4 to 6 metres of water were reef sharks and colourful coral fish.

Suddenly we passed over a silver-grey slab of metal and what appeared to be a cockpit frame. The slab of metal was the wing of the Catalina! Concerned that we might overshoot and lose the position I raised my head and tried to shout "Wing!", but in the turbulence of being towed got a mouthful of seawater instead. I let go of the tow rope to get Helmut's attention.

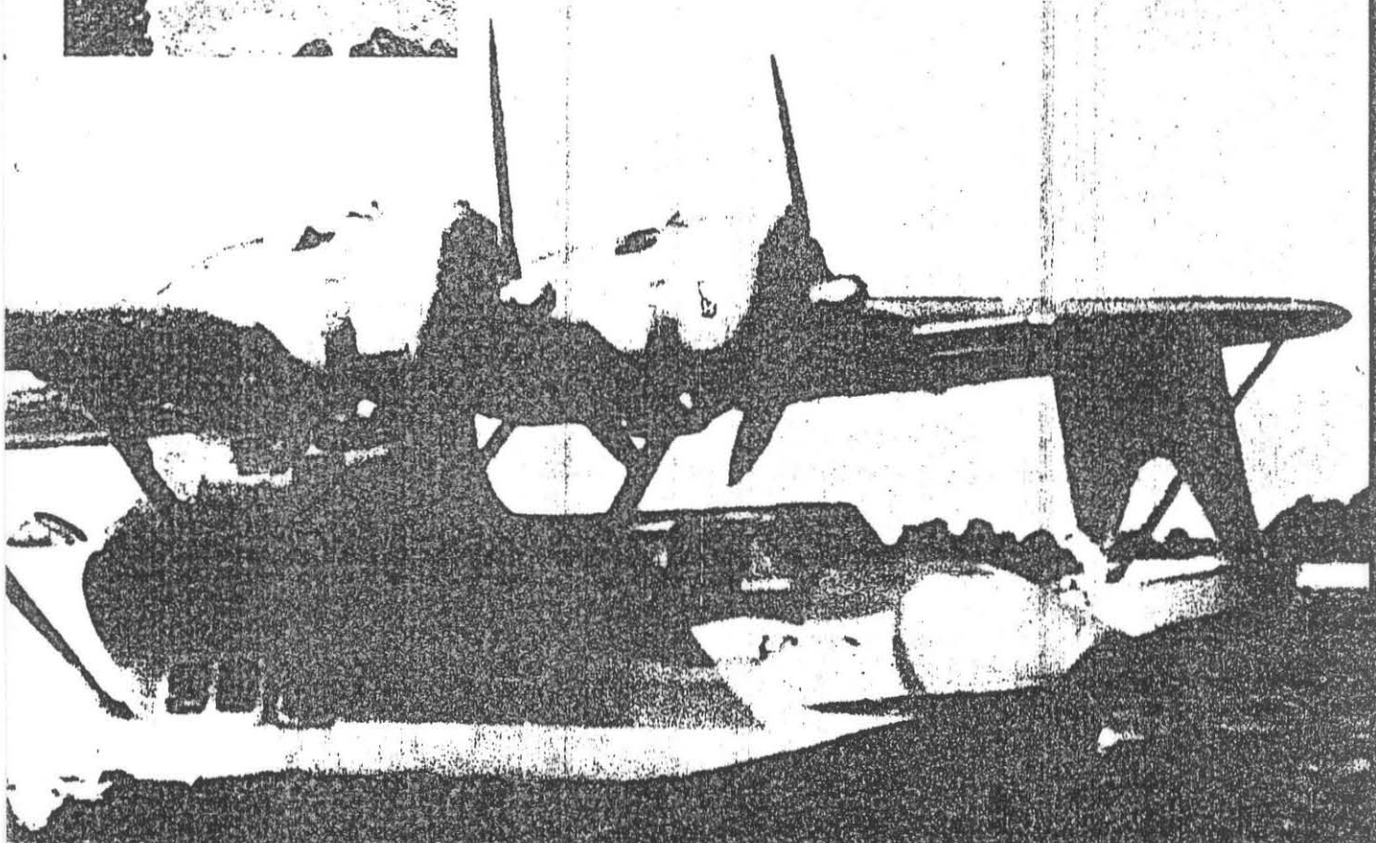
"A major find mate!" he said. We geared up fast and spent an hour or so in only 4 metres moving about the wreck site, photographing and drawing the layout of the debris. Some black damsel fish and big redeyes had taken up residence in gaps between the wing spars . The "cockpit frame" I'd seen from the surface turned out to be the frame of a perspex bubble commonly attached to the rear fuselage of Catalinas during the Second World War. It was lodged between growths of encrusting coral and a sliver of perspex still remained in one corner of the frame. The wing was about 9 metres long, and looked most likely to be the tail wing. A lot of aluminium debris was scattered about, including a ladder and what appeared to be an aeroplane exhaust muffler.



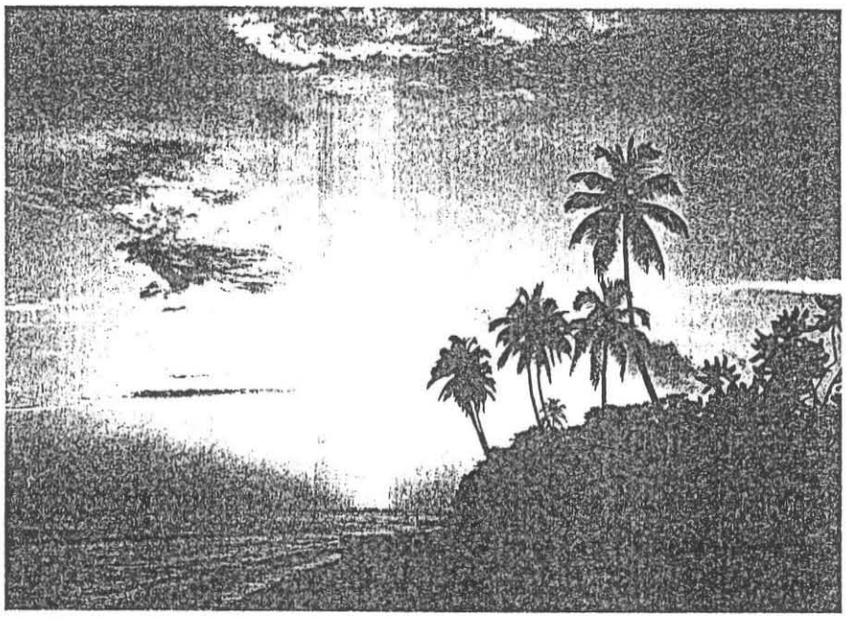
It was eerie inspecting this war-time grave site where seven men had died trapped inside. Two others later died of burns in the small hospital on nearby Direction Island. Of 14 passengers and crew only 5 men survived.

This tragic accident happened in mid-1945 when the Cocos (Keeling) Islands was home to 7000 Allied military personnel. An airstrip on West Island had been constructed from Marsden steel matting strips and from here Mosquito aircraft ran reconnaissance missions over Java, Singapore and Malaya. These were followed up by Liberator bombing missions on Japanese targets from Cocos.

The northern part of the beautiful Cocos Lagoon between Direction and Horsburgh Islands became the landing strips for Catalina flying boats which made over 800 secret crossings of the Indian Ocean between Ceylon and Perth. Apart from transporting



We had spent about about 20 minutes searching an area two kilometres southwest of Horsburgh Island on a fairly flat lagoon. A few hundred metres north lay the wreck of the coal barge *Phoenix*, a local landmark. We felt we were near where a pair of Catalina engines and propellers had been found in eight metres several weeks prior by Gavin Denton West, island resident and former President of the Cocos Island Dive Club. He had been looking for a lost yacht anchor at the time.



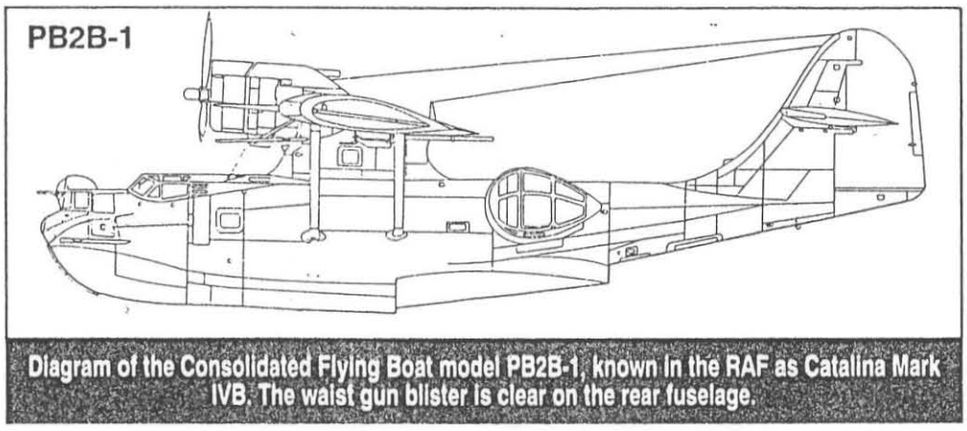
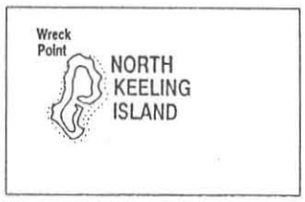


Diagram of the Consolidated Flying Boat model PB2B-1, known in the RAF as Catalina Mark IVB. The waist gun blister is clear on the rear fuselage.



heavy machinery, personnel, mail, they also flew operations against enemy shipping.

On 27 June 1945, Royal Air Force Catalina JX 334 attached to No. 240 Squadron arrived in the vicinity of Cocos after the long haul from Red Hills Lake Air Force Base in Madras, via Colombo. It was carrying crates of heavy machinery and 14 men. Capstan bin Benjamin, 73, a former carpenter and Cocos Islander from Home Island, remembers he was constructing a wooden bed at the time, which was about 11.00 am. A strong southeasterly was blowing with a big chop on the lagoon and he remembers the plane landed downwind and flipped over. He saw wreckage blazing a long way off from Home Island and remembers that the sea appeared to be on fire. He was so affected by this event that he later named one of his daughters "Catalina".

Another , Bynie bin Satar, 76, was one of only 3 Cocos Islanders who worked for the RAF as a marine pilot during the war. He was involved in the rescue and saw the plane come in to land downwind, not upwind as was normal. Bad weather was in the vicinity and a moderate swell was coming in through the northern entrance of the lagoon. Bynie also remembers the time was 11 am and the plane was trailing smoke as it came in. He saw the plane hit the water, flip over, then sink quickly.

Several years later when hunting turtles on a perfectly flat lagoon with a friend, Bynie saw the body of the Catalina still resting at the bottom. From his small wooden *jukung* (traditional Cocos sailing dinghy) the plane still appeared whole.

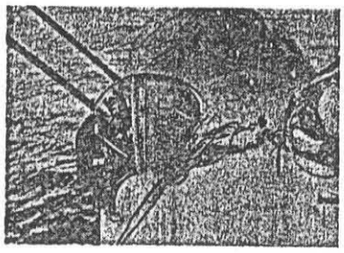
A friend of Bynie's, Mr Peter Byrne, now Executive Director of The International Wildlife Conservation Society, was among the first rescuers to arrive at the crash. Peter was then working at the RAF Air Sea Rescue Station on Direction Island. By telephone from Mount Hood, Oregon, where he now lives, he told me he and others from the station were on standby and saw the Catalina come in to land. He remembers exclaiming "My God, why is he coming in downwind?" The plane hit the water, bounced, fell nose-first into the water in a great burst of spray, and immediately caught fire. Peter and his group were at the scene in their fast boats within 3 minutes and were able to rescue 7 of those on board, but the rest went to the bottom 10 metres down. Peter also believes the Catalina may have flipped over before it sank and those inside may have been trapped or crushed by the crates of heavy

machinery which would have come loose in the initial impact. In those hectic closing months of World War II, the bodies were never recovered.

Three years ago Peter returned to Cocos and searched extensively for the wreck with much help from local boatmen, all to no avail. It is quite possible that what we have discovered, was until recently covered over by sand. Cyclones and associated heavy swells move huge amounts of sand about the lagoon and during 1989 several bad storms hit Cocos, which may have shifted the sand to reveal the debris we have located.

Helmut and I found the peace and tranquillity of this underwater war-grave humbling. Even the fish living in the wing, fearless at our inquisitive approach, seemed to demand we respect the site. We completed our recording of the wing and bubble frame site, and surfaced. Back in the boat we took bearings on some landmarks, among them Prison Island, a small coconut island to our east, and Pulu Maria, another tiny island on our southern horizon.

A week later we returned and succeeded in finding both engines and propellers. Hiding in some nooks at the base of each of these wartime Pratt and Whitneys we found three venomous lionfish. Brown with white stripes, they waved their graceful tails and poisonous fin spines at us, unconcerned. The engines lie about 5 metres apart on a large open patch of sand, and both of the three-bladed propellers have a pair of blades lodged in the sand with the third blade pointing vertically upwards. Both the vertical blades haveheavy coral growths; one even has a growth of dead *poccollopora* branching coral. A large amount of loose debris , including two aluminium seat frames, is within a 30-metre radius of the engines. The tail wing and bubble frame, surprisingly, are located about 350 metres to the soutwest.



As far as the local people know, no salvage attempt has ever been made on the Catalina, so it seems clear that 45 years of heavy swells and storms has broken up the aircraft and spread debris over a wide area. Over time shifting sands have covered this debris and recently have receded to reveal to us, perhaps for only a moment, some of the lagoons wartime secrets. What other secrets remain to be found?

Top far left: Standard sunset in Paradise – from West Island, Cocos.

Top left: A close-up of the waist gun blister frame. Slivers of perspex can still be seen in the frame.

Right: We found this leading-edge section of the tail plane some 350 metres south west of the Catalina engines.

Below: The waist gun when it was still in action.

Twelve kilometres across and 17 long, the total land area amounts to only 14 square kilometres. Horsburgh Island, in the mouth of the horse-shoe in the northwest quadrant of the atoll, makes up the 26th island. North Keeling, 24 kilometres north of Horsburgh is the 27th, a lonely separate atoll, a place of embracing beauty and a major Indian Ocean bird colony. The Cocos (Keeling) Islands lie 2768 km northwest of Perth in the Indian Ocean, south of Indonesia and 1660 km southwest of Singapore. The islands were thus very strategically placed during WWII, but since the war have largely been forgotten. The population of 600 people, 430 of whom are Cocos Malay residents, is serviced by flights from Perth.

Qantas Catalina Flying Boat
Engines: Two 1200 hp Pratt & Whitney R1830-92.
Passenger capacity: Low density – 28,
High density – 44 (New Guinea ops).
Cruising speed: 105 mph
Registration Nos.: VH-EAW, EAX, EBA, EBB, EBC, EBD, EBU.
Routes flown: Australia/Pacific Islands, Indian Ocean operations, New Guinea charter operations for Australian Petroleum Co. Introduced into company's service in 1943. Qantas operated this type of aircraft on the Indian Ocean operations during 1942-1945. Five aircraft were employed between Perth and Ceylon, the longest crossing being 31 hours 55 mins. This service was also known as the *Double Sunrise Service.*
Registrations were: G-AGFM, G-AGFL, G-AGIE, G-AGID, G-AGKS.

Courtesy of CAA Cocos

ATTACHMENT 8

The Gazettal notice for the Broome aircraft wrecks

Government of Western Australia

Heritage of Western Australia Act 1990

Conservation Order

Flying Boat Wreckage Site located in Roebuck Bay, Broome,

WHEREAS

In my opinion it is necessary and desirable to provide special protection in respect of a Flying Boat Wreckage Site in Broome, being that portion of seabed land located in Roebuck Bay, Broome as is now defined by Heritage Council of Western Australia survey drawing No 4859 as prepared by Fugro Spatial Solutions Pty Ltd, (and was defined in Schedule 1 of notice HR401 published in the Government Gazette on 25 October 2002 on page 5318) and situated in Roebuck Bay, Broome ("the place").

now pursuant to section 59(4) of the Heritage of Western Australia Act 1990 (the Act), I, Dr Judy Edwards, Minister for the Environment and Heritage, HEREBY PROHIBIT the demolition, damage or alteration of the place or any portion of the place, or any structure on the place.

DATED the 17th day of December 2002.

DR JUDY EDWARDS MLA
MINISTER FOR THE ENVIRONMENT
AND HERITAGE

ATTACHMENT 7

Aircraft Wrecks as archaeological sites

Bulletin of the Australasian Institute for Maritime Archaeology (2004), 28: 81–90

Historic aircraft wrecks as archaeological sites

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Email: michael.mccarthy@museum.wa.gov.au

Introduction

This paper will examine the processes that have recently led to a broader recognition of the submerged aircraft as a maritime archaeological site. Ethical issues, site formation processes, conservation, site management strategies, and legal matters will be examined, along with the protection of a suite of fifteen aircraft by a Conservation Order promulgated under the *Heritage of Western Australia Act 1990*. The protection of those wrecks after fifteen years applying *ad hoc* management strategies will also be presented as a case history of value in an understanding of the subject and of the manner in which a new legislative 'force' has been introduced into Australia's underwater archaeological world.

The development of aviation archaeology in Australia

Maritime archaeological interest in aircraft wrecks in Australia commenced a quarter of a century ago in 1978 with Scott Sledge's interest in two wrecks in the Kimberley. First the remains of the fabled '*Diamond Plane*', a WWII DC3 lying in the intertidal zone at Carnot Bay, and second, a float from the equally famous *Atlantis,* a Junkers Seaplane that landed near Kalumburu in 1932 (Sledge, 1982).

In the first instance, Sledge was beaten by the tides, but had he been successful would have seen little of the refugee and diamond-carrying DC3 aircraft (Prime, 1985). Subsequent inspections showed that only a 12-metre section of the port wing remained visible above the sand in the intertidal zone (partly as a result of WWII salvage work). In the second, the float was found much as it had been abandoned by two German aviators Hans Bertram and Adolph Klaussman. En route from Timor to Darwin, they ran out of fuel and force landed; their survival being an example of Aboriginal generosity, commitment and care. The float was subsequently recovered by Sledge, assisted by a Royal Australian Navy (RAN) team. Following conservation it was placed on exhibit first at the Western Australian Maritime Museum and, after a period of prolonged storage there, late in 2003 it was loaned to the Royal Australian Air Force (RAAF) Aviation Museum in Bull Creek. The *Diamond Plane* has been the subject of a number of works and films, and two books have been written on the *Atlantis* incident (Bertram, 1936; Winter, 1979). A film on the epic and a number of exhibitions were presented under the title of *Flight to Hell* and the story features in the *Strangers on the Shore* compilation listing the interaction of accidental visitors to these shores with indigenous people (McCarthy & Sylvester, 2000).

There are many other wartime aircraft lying in Australian waters. To name but two as-yet-unfound examples, one a fighter piloted by the famous WWII 'ace' 'Bluey' Truscott was lost at sea off Exmouth in Western Australia while escorting a Catalina into base, and another a Beaufort piloted by the well-known C.C. Learmonth crashed between Rottnest Island and Fremantle while on a test flight. Both men were of such standing as to have their names commemorated in WWII and modern airbases, and their aircraft are considered highly significant in that context alone. While the circumstances of many other aircraft wrecks is more pedestrian, and while still more are as a result of deliberate scuttlings at sea as WWII came to an end, across the country the numbers of submerged planes, some containing human remains, will run into the hundreds. Recently there have been moves in various Australian states designed to quantify the submerged aircraft lying in their waters as a regional and national archaeological resource. Presently these appear, along with a number of case histories and conservation programmes, in a website produced by noted aviation photographer Jon Davison and this author entitled *Broken Wings* (http://www.museum.wa.gov.au/mm/Museum/march/fallenangels/ fallenangels.html).

The aircraft as an archaeological site

It is evident that a driving force in the location of lost aircraft sites throughout the world in an amazing variety of locations and situations (e.g. in jungles, swamps, under the sea, in ice even) has been the growth of interest in aircraft wrecks as restorable units or as a source of parts for other aircraft, or materials for museums.

At the other end of the spectrum, and as with the shipwreck, dive shop owners, recreational dive clubs and tourist bodies also view the sunken aircraft as an asset and actively seek new sites. Most of these bodies now seek to preserve the sites *in-situ* and many appear illustrated in dive and aviation magazines, on websites and in the general literature. All attest to the widespread appreciation of the submerged aircraft as a valuable dive site, where conditions permit.

A perusal of one recent work entitled *Hunting Warbirds* (Hoffman, 2001) shows that it is very aptly sub-titled as 'the obsessive quest for lost aircraft of World War II'. There, a number of complex underwater search and recovery missions appear and it is evident that the modern search for submerged airplanes reflects the almost frenetic search for shipwrecks soon after the invention of the Aqualung. A parallel of direct interest to the underwater archaeological fraternity are the words of one couple who had worked for Mel Fisher recovering materials from the 17th-century Spanish plate ship *Atocha.* Apparently 'tired of treasure hunting' they transferred their love of heritage things to aircraft recovery and restoration. Their words provide a very important insight.

> When we were doing the *Atocha* we had thousands and thousands of five-hundred-year-old artefacts, but no people... we could only make assumptions about the people and the artefacts we found. But the guys who flew these airplanes are still around. We can talk to them. They come here all the time... (Hoffman, 2001: 230).

For good reasons and partly because many did not accept that both the aircraft—and the very act of recovery and restoration itself—were important heritage-related events newly-found aircraft crash sites are quite late in being recognised as potential archaeological sites. This is partly because so much is known about the construction, history, crew, and working life of most service aircraft and partly because the pilots and crew, or close relatives are often still alive, providing on the one hand an invaluable and inspirational 'touchstone' for people like those mentioned above, but at the same time serving to infer that nothing new can be learned—largely because the very people who built and operated or flew the machines are still alive.

A parallel to this idea was the study of iron and steam ships. There, the late Keith Muckelroy, one of the doyens of maritime archaeology, saw the study of iron and steamship wrecks as an unnecessary duplication of information appearing in archives and museums (Muckelroy, 1980: 10). Anthropologists, on the other hand, have long-since argued strongly against this position and opted for a 'cross-temporal' approach; one that is not encapsulated in a specific period of the past. George Bass noted 'the value of archaeological research on ships recent enough for photographic records to be available' (Bass, 1972: 10). His was a sentiment echoed by many in the underwater archaeology field and it is now recognised as applying to the study of iron and steam shipwrecks as much as to wooden sailing vessel sites. It is argued in these pages that the same applies to the submerged aircraft.

In the examination of the archaeology of the submarine, as a class of iron/steel ship, it quickly became evident that an operational submarine was a capsule that 'flies' though a hostile and unforgiving medium. It can contain, not only the accoutrements of warfare, but a range of materials of wider significance, e.g. personal items that reflect society and the forced adaptation to life in an enclosed, restricted and hostile environment (McCarthy, 1998). The aircraft is little different, and though it is less likely to reflect this possibility, given that it is 'flying' for a maximum of a few days rather than weeks, the general observation that 'new' insights about human behaviour might be obtained from a study of the remains still holds good, especially to those archaeologists and anthropologists having a better-than-passing knowledge and understanding of the subject. The author, and Richard Gould were, or still are (in Gould's case), active pilots and with that added perspective both strongly believe that a properly-constituted archaeological focus on not just the technology of the aircraft, but also the people and the associated assemblage of cultural materials (artefacts) within the wreck site allows us to view the archaeology of the lost aircraft as a valid 'new' area of study within the theoretical framework of archaeology and maritime archaeology as a whole. Others are also actively involved in these theoretical analyses. In their analysis of the Kaneohe Bay PBY 5 Catalina at Pearl Harbour, for example, Rodgers, Coble and Van Tilburg (1998) have found that when the archaeological evidence (the aircraft wreck and its contents) is analysed along with written material, i.e. the archives, oral histories, plans, books, logs, diaries etc. they can appear as both complementary and potentially conflicting databases, i.e. they both add to existing knowledge and sometimes contradict what was believed to be true. Thus the properly constituted study of the newly-found aircraft wreck can be considered a form of historical archaeology. The Catalina wrecks lying in Darwin Harbour are an instance where an entire suite of submerged, or part-submerged aircraft have been used in the same context (Jung, 2001). So too with the fleet of Flying Boats at Broome in the north of Western Australia. Their significance not only lies in their being examples of the wartime Catalina, Dornier and Short Empire types, but also as representatives of some of the last Allied operational units fleeing south ahead of the Japanese. Some, notably the Short Empire types also carried some of the *c.* 8 000 civilian and service refugees who were also airlifted out over the space of a few short weeks in WWII (Jung, 2004). When destroyed at anchor, they contained a remarkable range of materials telling us a great deal about refugees fleeing ahead of an advancing enemy, who were severely constrained in what can be carried within their aircraft (McCarthy, *et al.*, 2002). The ability of the aircraft to provide both conflicting and complementary data to both the written and oral historical record was clearly demonstrated recently in an oral history programme conducted with survivors of the Broome aircrew. While those from one of the Dutch Catalinas were adamant that their cutlery was not inscribed with the aircraft's number, for example, a fork recovered from one of the wrecks was found to carry their aircraft's identification number. They were astounded to be presented first with the identification of their flying boat and second with the evidence that their memory was faulty (Souter, 2003). This single incident can serve to validate the properly constituted study of the submerged aircraft as a form of historical archaeology.

On reflection none of this is really new to aviation wreck 'buffs'. Though they may never have considered it as such, the examination of crash sites, both old and recent, the recording, the research including analyses of the written and oral records, the subsequent dismantling of the aircraft and engine components for inspection, the metallurgical reports, the painstaking observations, and the objective conclusions that the accident investigator routinely makes have long-since been one of the benchmarks for technical forensic analyses (of the archaeological type). It is equally so with the management of any human remains found within the wrecks, and there are many

examples of best forensic and recording practice at lost aircraft sites that long precede this discussion. In some ways, one could suggest that those who have been dealing with crash sites, especially those tasked with the recording, recovery and burial of lost service personnel, have been waiting for the archaeological world to catch up and to realise what important information can be had and what innovative methods are being used in this field!

There are many instances where little attention is paid to the full recording of a site before materials, or the entire wreck, are removed for conservation, restoration and exhibition, however. Some appear detailed in *Hunting Warbirds*. In these cases, pre-disturbance records, field and day books, artefact registers, the photographic and video records were either not undertaken, not kept after the project was finished, nor made available to other researchers, partly because the work was not considered of historic or archaeological importance.

In general, it can be observed that if it is accepted that a particular aircraft wreck or suite of sites can be considered as an archaeological site (i.e. capable of providing 'new' or otherwise unobtainable information about people and how they operated in an aviation environment), then it needs to be afforded as much consideration from a methodological and ethical perspective (e.g. conservation, excavation and exhibition) as is afforded the terrestrial archaeological site or the shipwreck.

Site formation processes

Archaeologists seek to document site formation processes at any land or wreck site in order to better understand the present state of the remains, and to then be in a position to make valid comment and inferences based on the remains themselves.

In knowing how a wreck disintegrates and how the site forms over time as a result of natural site formation processes, such as time, tide, corrosion etc., cultural formation processes (the results of human activity) are better understood.

In the absence of a clear understanding of site formation processes, the submerged aircraft heritage professionals examining a Catalina site in the Cocos Islands were recently wrestling with unresolved site identity problems. Not only did they not find items such as forks inscribed with the aircraft's identification numbers, but they did not have enough information allowing them to conclude whether the state of the wreck they had found reflected the circumstances of the one known loss in the area. Here, the study of site formation processes at the sunken aircraft or flying boat site will eventually prove to be an essential tool in controlling for the archaeological variables found. While the study of site formation processes in terrestrial archaeology, and on wooden and iron wrecks sites is well-established, the processes at aircraft are a relatively 'new' study with recent examples being research into the 'Black Cats' scuttled off Rottnest Island as part of WWII Lend Lease requirements (McCarthy, 1997), the Catalina wrecks in Darwin Harbour (Jung, 1996, 2001), and now the Broome aircraft (McCarthy, *et al.*, 2002; Jung, in prep.).

Suffice it to note at this juncture that there have been some surprises in the study of site formation processes at the submerged aircraft! While the fall of engines (propeller downward from submerged high wing aircraft), for example, is to be expected over time, partly as a result of differential corrosion of the steel engine supports in an aluminium airframe; the inversion of the wings in an entire suite of wrecks was not. In the Darwin case, Silvano Jung illustrates and reports on the effect of fire, or explosion in the fuselage of flying boats with intact outboard floats, showing a characteristic inversion of the wings as the hull sinks and the wings break at the roots. These same phenomena were experienced at the wrecks in deeper water at Broome on the Western Australian coast. At Broome, this was once thought to be the result of large ships anchoring above the wrecks and literally tearing them to pieces as they dragged in the high winds, or cyclones common in northern Australian waters. Thanks to Jung, it is now understood that one needs to expect to find inverted wings where aircraft are fitted with wing tip floats (Jung, 1996; 2001).

The Falklands War, where images of the aluminium superstructure on those frigates burning away were flashed across the globe, provides another possibility. Did a similar thing happen with the flying boats? Did they burn down to the waterline as often happens with wooden and fibreglass boats today? Readers are referred to Jung's extensive Master's thesis (2001) his 2003/4 study at the Broome sites, his coming PhD thesis and to a number of articles written on the subject. In those works the beginnings of the study of site formation processes at the submerged aircraft is manifest in a compelling manner (Jung, 1996, 2001, 2004, in prep.). Another conundrum at Broome was the small amount of fuselage found projecting above the sea-bed at most of the deep-water aircraft sites. Was it the result of fire, as described above, or was it the effect of 'primary salvage' i.e. legitimate recovery work undertaken by the owners of the wrecks and/or their agents? In this case it was rumoured that 'apparatus' or 'hard hat' divers had descended down to the wrecks in WWII and had used explosives in their attempts to remove part or all of the wrecks and their contents, including trapped bodies. Evidence of a WWII salvage programme was found when an oral history programme resulted in a interview conducted this year with the 104-year-old leader of that work (Souter, in prep.). This will need to be weighed against the material record, for there appear to be many inconsistencies (Jung, 2004).

Conservation science

Non-disturbance site inspection programmes and the production of management plans that encompass site access strategies for local recreational divers and for tourists, is especially dependent on good conservation/biological/human impact advice to help ensure that the wrecks are best managed for the often conflicting needs of the present and the future. If sites and materials are

being examined with a view to their being excavated and raised in part or whole, then conservators and/or experienced restorers are best placed to advise on the state of the materials under scrutiny and the feasibility of the conservation of the recovered remains.

Aircraft are also relatively fragile with light frames or aluminium or wood and sometimes with very thin outer coverings of light metals and sometimes fabric. There are also many variables to be considered, such as the presence of dissimilar metals e.g. copper/aluminium rivets on an aluminium airframe, steel/aluminium-working methods, water movement, oxygen levels, the depth of burial in sediments, the presence of sulphate-reducing bacteria, and the like. As a result, like the iron or steel shipwreck, the corrosion found on aircraft is expected to vary greatly, not only on individual airframes as a whole, but also on its various parts within one particular wreck. Again, while none of this is new, it can come as a great surprise to those not aware of these issues who are presented with what otherwise appears to be a strong wreck, lying intact on the sea-bed.

Another factor to be considered in some environments is the presence of concretion, a rock-hard matrix of corrosion-products and sea-life that serves to totally cover metallic objects in a warm-water, coralline environment. This concretion can mask the extent of the corrosion and give a totally false impression of its extent and of the strength of the metallic remains underneath. After removal of this rock-hard layer, sometimes only empty casts of the original hull remain. This situation is of considerable importance for those interested in the raising and exhibition of any historic aircraft raised from a saline, warm-water environment. Decades of corrosion will ensure that, after it is deconcreted for conservation, the sunken plane can be a terrible disappointment to those who once looked on what appeared to be an intact aircraft. How many times is a heavily concreted object raised from the sea-bed and then abandoned when its deconcretion and conservation proves too difficult, too time consuming, or too expensive? As a result, the raising of any historic aircraft must be undertaken with the full understanding of the fact that while they might look intact, they are almost certain not to be so, especially once they are deconcreted. If they are to be removed, they also need be raised in the knowledge that the conservation of an aircraft submerged for decades requires a long-term commitment of time, staff and funds. The easiest part is in the raising, for—with the exception of a small submarine—an intact aircraft is perhaps one of the most easily removed of all archaeological sites, for it too is often an enclosed capsule (albeit one with wings). Again none of this is new to the aviation fraternity—some of whom have spent thousands in money and years in time recovering, refurbishing and presenting aircraft for private and public purposes, some in working order.

There have been some amazing examples of successful recoveries of aircraft from forests, jungles, ice-fields and lakes. To date there have been few from a saline environment, though a recent account of a P.40L Kittyhawk recovered from the sea-bed near Latina in Italy may be a pointer of some success in that medium (Giannitrapani, McDonald & Colla, 2000). Another occurred in the October 2003 recovery of a Junkers Ju52 from 41 m of water near the island of Leros in the Aegean Sea. It was transported to a Greek airbase near Athens to be restored by the Hellenic Airforce museum (http://www.geocities.com/hjunkers/ju_ju52_m23a.htm). Of interest will be the effect of depth and burial in these two instances.

One example, where a feasibility study conducted into a proposal to search for and recover aircraft scuttled at sea under the WWII 'Lend Lease' programme, found against the plan appears in this author's 1997 'Black Cats' study. There, the recovery of one of a group of Catalina wrecks was mooted as a much-needed memorial to a famous class of aircraft and their crew. An explanation of the problems, difficulties and potential costs as outlined in the feasibility study into the search, location, recovery, conservation and presentation of any wreck recovered after half a century underwater, led to a decision to not proceed. The proponents then searched the world for a suitable alternative and sourced one in America. Transported to Western Australia, it now lies in store awaiting placement in a special memorial to the trans-ocean flying boats of WWII at the old flying boat base on the Swan River near Perth. There is also a Catalina on exhibition at Albany Whale World on the south coast. It actually saw service in Australia, rendering it of additional importance and both it and the American example will better serve the interests of those seeking an easily managed memorial.

Protection of aircraft sites: The Broome case study

As indicated, aircraft, like all other archaeological sites, generally are subject to a number of processes serving to alter the original machine from an operational unit into an archaeological site and sometimes grave. On a physical level these are natural and cultural site-formation processes. On a philosophical level there are also changes in public, academic and official perceptions or attitudes to the remains. These change over time, and added to these perceptions are the changes that occur in its legal status over time.

An interesting example is the case of the Broome flying boat wrecks, and the gradual change in public and official perceptions of them over time. This matter (the change in perceptions) was examined in an earlier paper on the submarine as an archaeological site and readers are referred it and to the appendix to that paper examining the legal considerations applying to vessels and aircraft of 'State' (McCarthy, 1998; Roach 1996). These aircraft were a casualty of war, still owned (unless surrendered) by their parent service (Dutch, Australian, British and American), with strategic importance as a source of munitions and spares. The Broome aircraft became a post-war salvage prospect—more as a navigation hazard than as a source of usable or saleable items—then they were viewed as a source of souvenirs of a bygone age. In

the 1960s, they came to be seen as a 'resource' providing museum objects and also materials for the growing band of aircraft restorers. Lastly, they have come to be recognised as former war graves, as historic sites and as cultural tourism assets in both above water and below water mode. Many of the activities occurring over time at these sites were examples of 'secondary salvage', i.e. recovery work conducted without official sanction. Later, as protective legislation was put in place, proposals and schemes for the recovery of materials were required to fit within the framework of the legal situation applying to each case. Here we found the various military services first stressing their rights, then allowing the remains to be managed by a variety of formal and informal heritage strategies under the umbrella of heritage authorities. Many of these issues are apparent in the case study following.

The Broome air raid

An evacuation of the Netherlands East Indies ahead of a Japanese invasion began in February 1942 when all allied citizens were ordered out of the East Indies and over 8 000 refugees were evacuated to Perth and Sydney via Broome in a two-week period. Many aircraft were used in the evacuation and on one particular day 57 aircraft of various nationalities and types (including bombers and Flying Boats) passed though Broome. On the morning of 3 March 1942, fifteen flying boats were at anchor in Roebuck Bay, not far from the town jetty. Bound for Perth and eastern states capitals, the aircraft were delayed in their take-off by a combination of low tide and the need to refuel. Caught unprepared, they were subsequently destroyed by Japanese warplanes that arrived overhead at 0930. Though between 70–100 people, mainly civilians, were inadvertently killed, the Japanese pilots apparently had orders to seek out only military targets and this they did to good effect—for all the flying boats in the harbour were in Service with the Allies. The event was such a psychological blow that it has been referred to by some aviation historians as 'Australia's Pearl Harbour' (Prime, 1985).

The lost aircraft were:

RAAF (Ex Qantas Aircrew) BOAC (Qantas Aircrew)	1 x Short Empire 1 x Short Empire	*A 18-10* *Corinna*
RAF	2 x PBY-5 Catalina	*W8423 & W8433*
RNN	5 x Dornier 24K 4 x PBY-5 Catalina	X1, X3, X20, X23 & X28 Y 59, Y60, Y67 & Y70
USN	2 x PBY-4 Catalina	Patrol Wing 10

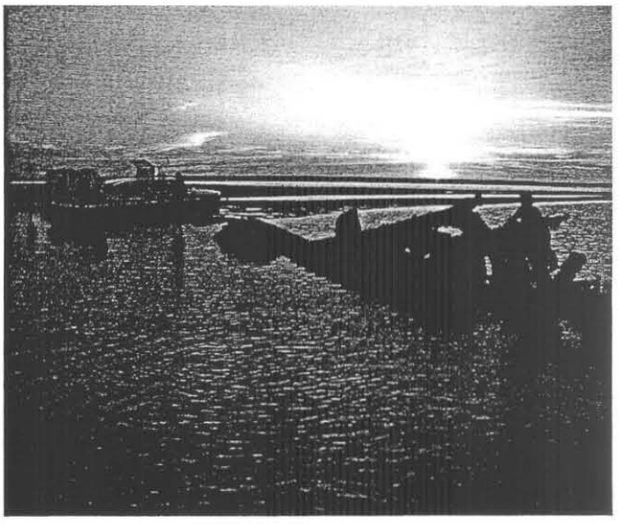

Figure 1. A 'drying wreck' at Broome. (Photo; J. Green, Department of Maritime Archaeology.)

Broome experiences a tidal range, sometimes in excess of 8 m and when the tide receded one group of six aircraft were left visible, or part visible, on the drying mud flats (these are referred to as the 'drying wrecks').

Another group of nine were either totally submerged or nearly so. These 'deep-water wrecks' were lying on the side of a sloping mud bank or on the sea-bed in the shipping channel offshore. Where possible guns were removed for use as anti-aircraft guns to defend Broome against further attack, for example. It is now known from the oral history study referred to above (Souter, 2003) that service divers in 'standard dress' (popularly known as the 'hard-hat') also dived on the wrecks to try and remove them from the path of a proposed Flying Boat base that did not eventuate. Explosives were used and parts of the wrecks were dragged away to be dumped in deeper water. Being a legally-sanctioned recovery performed by the owners or their agents, this form of cultural transformation is termed 'primary salvage', as indicated earlier (McCarthy, 2000) Much of the materials remaining inside the wrecks after this activity was quickly covered in deeper layers of mud, both inside and outside the hulls, serving to trap much of it in an anaerobic environment, allowing even quite fragile objects to remain preserved. As time progressed a light layer of concretion covered all bar the stainless steels and toxic substances (e.g. brass) serving to add further to the protective layers.

The management of the Broome wrecks into the 1980s

While the 'deep-water wrecks' quickly slipped from mind, the six that dried at low water became a source of endless fascination for the Broome community and for the occasional visitor. The sites were often subject to 'secondary salvage', i.e. the recovery materials from wrecks without a properly designated authority. In this context materials like guns, engines and propellers were removed for exhibition in town and community leaders in Broome took all possible steps to ensure that what was raised remained on exhibition in the town or on the shores overlooking the site. They initially

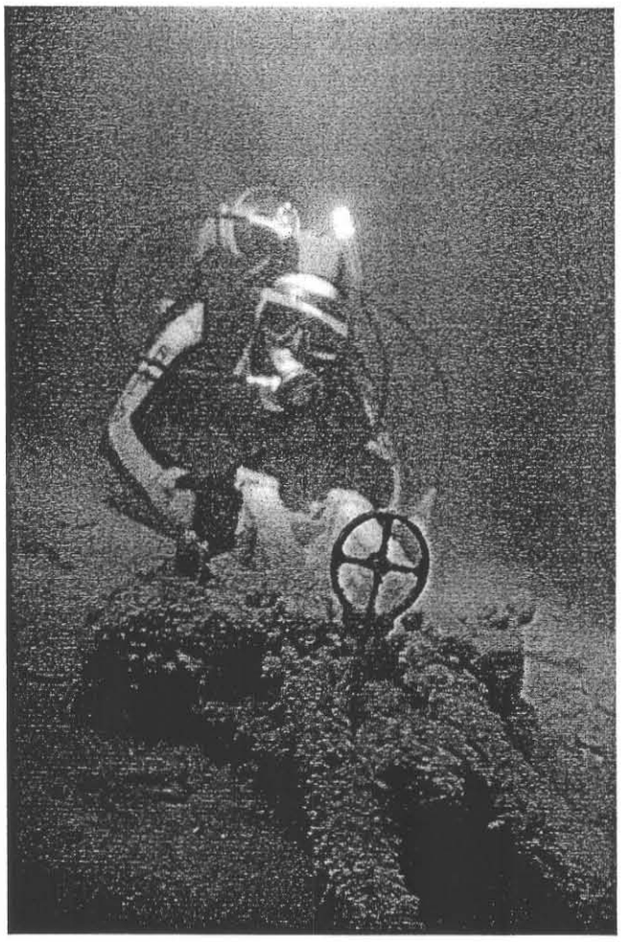

Figure 2. A machine gun photographed on one of the deep water wrecks in 1990. (Photo: Eve Boogard.)

succeeded in this aim, partly because Broome was then quite an isolated and small community, accessed only by a long and difficult gravel road, the State Shipping Service and a basic air service. Interest in the wrecks spread, nonetheless, and in 1980, the Shire of Broome was led to formally express concerns about the projected salvage of relics by Perth-based and Eastern States aviation history groups. Casting around in an attempt to forestall the proposal, the Shire and the Broome Historical Society sought the advice of the WA Museum on the best means of protecting the aircraft under its legislation. While reply was received that no provisions existed under the *Museum Act* or the *Maritime Archaeology Act 1973*, reference was made to the possibility that the *Commonwealth Historic Shipwrecks Act 1976* could be invoked, however. In response to a request for a ruling on the matter, the Commonwealth Government indicated that while it could not apply shipwreck legislation to the submerged aircraft, an attempt would be made in order to facilitate their protection through the reciprocal agreements with other countries (Broome Aircraft Wrecks File MA-13/86).

Official intervention was required in the Broome case because allied and Australian warplanes lost in conflict in Australian waters remain under the ownership of their parent Service, unless transferred to the Australian Government. Japanese aircraft wrecks lying on Australian territory were forfeited to the Australian Government at the end of the war. With only Dutch aircraft remaining under ownership of their parent government, Australia became the responsible body in all respects concerning the American, Australian and Japanese aircraft lost off Broome in WWII. The Netherlands Consulate was approached by prospective salvors in 1980, and, representing the Netherlands Government and the Royal Netherlands Navy (RNN), the Consulate reasserted ownership of the downed Dutch flying boats, but then authorised the salvors to recover materials from some of their aircraft. They did require that the salvage be performed only in association with the Shire of Broome, however, and they set the condition that the RNN was to have first choice of material raised for exhibition in Holland. This idea was reminiscent (and part-based on) of the Australia Netherlands Committee on Old Dutch Shipwrecks (ANCODS) Agreement earlier established in order to deal with the Dutch shipwrecks lost off the coast of Western Australia.

Thus the 'drying sites' were substantially altered over time, and there no obvious artefactual remains left on the surface in or near each aircraft. For a number of reasons there were also few known attempts to conduct an excavation deep within the mud at any of the 'drying' hulls. The best known occurred in the late 1970s when noted aviation historian Stan Gajda excavated some internal spaces in a 'drying' Dornier wreck which was identified as the X-1 by tools stamped with this number (Gadja (*sic*), 1980, 1982, 1983). The ingress of water and mud and the threats posed by the incoming tides rendered the excavation of these sites difficult. The Gajda excavation shows that the interior of the buried portions of these aircraft is a rich source of artefacts. Those that were subsequently inspected by the Museum in 1990 as part of the wreck inspection programme showed intact structure below the sediments. At the time, the other aircraft (the deep water group) lost in the raid had not been re-located, though a select few were aware that they lay somewhere in Roebuck Bay off Broome. Occasionally, people fishing in the bay would snag their lines on the wrecks and some realized that aircraft lay below. However, GPS still in its infancy, and with few people willing to dive in the often-difficult waters of Roebuck Bay, the wrecks remained little known.

The deep-water wrecks found by sport divers

In August 1990 divers located some of the 'deep water' wrecks and recovered a Browning .303 machine gun and a number of significant, and in some cases poignant, artefacts, including a child's doll. The matter was reported to the Historical Society by Mr Bill Carswell, a former Canadian heritage worker living in Broome. Again the Western Australian Museum was approached and advice was given that the materials raised were considered the 'property' of Broome and that all effort should be made to ensure their return. In the interim, the gun disappeared, causing some controversy and precipitating calls for the legal protection of the sites and the recovery of the lost

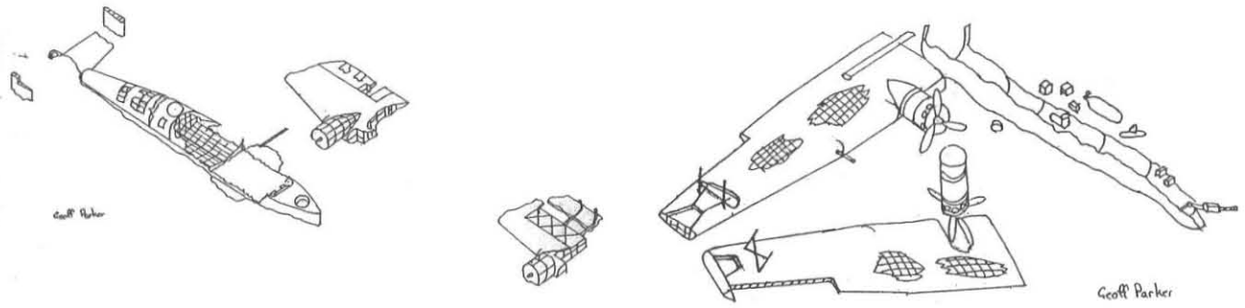

Figure 3. Two of the Parker site plans. (Drawings: Geoff Parker.)

materials. The Broome Historical Society considered the matter of 'grave concern' and stated that the relics were of 'little monetary value, but historically they are priceless'. (Secretary, Broome Historical Society, to M. McCarthy, 1990, pers. comm., 12 Sept.).

The application of ad hoc *management strategies in the 1990s. Early searches*

Given that existing shipwreck legislation was not considered appropriate and, at the time, the Western Australian *Heritage Act* had not been proclaimed, the newly established Air Force Association Aviation Museum in Perth, the Dutch Government, the Department of Customs, the Department of Transport, local and Federal Police were all contacted by the author on behalf of the Museum in order to ascertain whether the wrecks could not be protected by some other means. Eventually a legislative *pot pourri* was 'concocted' in order to prevent the removal of materials under air navigation and customs regulations. These prohibited the removing of material from wrecked aircraft, entry into an aircraft crash site without a permit, and the importation of aircraft parts without a permit (Minutes, MAAC, December 1990; Aircraft WA Waters, File MA-6/86). These regulations and the moral implications of interference with possible 'war graves' were informally conveyed to the divers at the Museum's request by State and Federal Police and by Customs staff. The looting then ceased.

This *ad hoc* management strategy was expanded to include long-term plans for the location, survey, inspection, interpretation and marking of all sites in a wreck trail milieu that was to be developed by the Department of Maritime Archaeology and managed locally by the Broome Historical Society on behalf of all stakeholders including the burgeoning tourist industry (Aircraft WA Waters, File MA-6/86). Funds were not available however, and sponsorship was sought. In the interim, visitation was monitored by the Broome Historical Society, whose premises overlooked the bay, and by sympathetic dive shop operators. While these precautions and the loose mix of legislative strictures that was applied had proved effective, it became apparent that with the advent of GPS the situation could readily change as the desire to access those lying in deeper water grew. This it was feared would leave the sites and the relics within them in a protective vacuum where goodwill and the 'bluff' outlined above would no longer suffice.

In March 1991, Woodside Petroleum and Associated Survey International (ASI) joined with the author in deploying a side scan sonar operated by expert oil-industry staff on a very large rig tender. Though this survey produced a number of targets, it proved incomplete due to gear failure. Soon after being incorporated into the Dutch multinational Fugro Survey, the ASI team completed another leg of the work, identifying further sites and setting the scene for the completion of the search and an inspection visit by a museum team as soon as money could be found (Fugro Survey, 1996). Though the funds and departmental support for the programme were not forthcoming, the sponsors considered the safety of the sites more important than their corporate needs for public acknowledgement of their generosity. They elected to make no further mention of the programme until the sites could be examined and protected. Given their considerable outlay in assisting the work, that they kept the confidences requested of them was remarkable. For a while the programme lapsed, though a keen eye was maintained with a view to locating appropriate funding sources.

In 1998, the author was approached by a well-known aviation photographer and film maker, Mr Jon Davison. He was interested in producing a documentary with the ABC on the four RAAF PBY Catalina's (the 'Black Cat's) that were scuttled, as part of the 'Lend Lease agreements' in the Rottnest Island Graveyard after World War II. Having concluded that this was not feasible due to location and conservation problems it was suggested that the focus of any application for funds using the ABC as a source would become the history, archaeology and protection of the Broome flying boat sites. This, it was reasoned, would enable the money to be applied to the completion of the search and analysis programme described above. A component for the presentation and marking of the sites in accordance with modern site management strategies was also fundamental to the application, as was provision for the conservation of any materials raised. As agreed earlier these initiatives were to be developed by the Department of Maritime Archaeology, in consort with the Broome Historical Society and RAAF Aviation Museum. While the danger that enhanced publicity could result in unwarranted diver interest in the sites, it was agreed by the chief stakeholders that this potential funding mechanism was then the only visible alternative. Davison subsequently produced a proposal for an historical and

Figure 4. Some of the objects recovered from the aircraft wrecks. (Photo: Department of Maritime Archaeology.)

archaeological based documentary entitled 'Australia's Pearl Harbour: The Japanese raid on Broome, March 3 1942'. The National Broadcaster, was unable to proceed, partly due to internal restructures and the matter was put 'on hold' until another backer, or alternative funding source, could be found.

In the interim, Broome resident Mr Geoff Parker became involved with the wrecks. An avid diver with a keen eye for history, he had learned of the wrecks and dived on some of the 'deepwater sites' after comparing notes with fishing friends. In returning to them with the aid of GPS and traditional transit marks he began to develop site plans, and an interest in the preservation of the sites. He had also scoured plans of the aircraft and, in one instance predicted where the navigator's desk at one of the 'drying sites' would have been located. He then visited the site, on low water spring tides, located the remains of a table, reached beneath it through the mud to find a sextant in its storage case. This was immediately reported to the Museum and to the Broome Historical Society and the sextant is presently being conserved at Fremantle. Around the same time, Geoff Kimpton, the Museum's chief diver, who was then on leave in Broome, joined Mr Parker in recording the two sites and both fixed their position with a GPS and produced a 3D plan. Their work also showed that the sites were extensive, though highly degraded. With other divers gaining access to GPS systems and with interest in the 'deep-water' wrecks clearly increasing in Broome, the Museum had to act quickly in the inspection of the 'deep water sites' and fortuitously another reliable funding source appeared.

In late 2000, former professional diver, maritime archaeologist, and noted film maker Ed Punchard began developing a *'Shipwreck Detectives'* series. This was to be produced in association with the Department of Maritime Archaeology and three projects, *Batavia* excavations, the Rottnest Graveyard and Broome Aircraft Wrecks programmes were considered suitable subject matter at the time. The Department suggested Mr Davison's 1998 proposal to Prospero Productions as a possibility and it was incorporated in the series. In providing the funds needed to order to complete the Broome aircraft programme, Prospero added a funding dimension to the aircraft saga. At this author's request this was to include provision for conservation and interpretive materials such as pamphlets, and above and below water markers.

The Museum's archaeological investigations.

Over the course of two field seasons between 3–25 May 2001 and 10–20 August 2001 the Museum team—with logistical and other assistance provided by volunteers (notably John Lashmar and Geoff Parker), and by Jon Davison, Silvano Jung and Prospero Productions—commenced further work at the sites. The remote sensing phase led by Jeremy Green resulted in the location of 15 sites, some producing remarkable side-scan sonar images. A comprehensive oral history programme was also conducted by Corioli Souter resulting in interviews with some of the World War II aviators mentioned above. They were flown in by Prospero Productions. Finally a site inspection and test excavation regime was commenced under this author's direction (McCarthy, *et al.*, 2003).

As a result of this work it has become apparent that the deep-water sites are rich repositories indeed, rivalling many shipwrecks in the wealth of materials contained within and around them. In addition to an assessment of the fabric of each aircraft, and the technical information that could be obtained, the question put by the archaeological director in the latter instance was: 'what, would a person or a child keep if ordered to board an aircraft and to jettison all personal effects in order to save space and weight in order to carry more refugees?' The material evidence, which includes materials raised previously including that presently on exhibition at the Broome Historical Society, indicates that it was things that were held most dear and that were small and portable.

One survivor recalled that each person brought on board only 'a little bit of hand luggage and they placed it anywhere there was room', and this is an indication that personal possessions may be found throughout

each aircraft not just in one compartment. Further, these personal items reveal more about the age, gender, social status and nationality of the refugees than any of the histories or recollections of the servicemen who met up with the Museum's team (Souter, 2003). The range of objects found, raised and stabilized in an on-site conservation facility were then added to those already on exhibition at the Broome Historical Society and the Aviation Museum at Bull Creek in order to obtain a fuller picture of what was on board. As indicated, in this phase a focus was on personal items.

These remote sensing, oral history and archaeological programmes have resulted in the preparation of a detailed archaeological report (McCarthy, in prep.), a web site (produced with assistance from Mr Jon Davison), http://www.mm.wa.gov.au/Museum/march/treasures/treasures.html, in the recovery and conservation of a range of artifacts, in a film *Bay of Fire* (by Prospero Productions), in the development of an extensive management plan and in an approach to the Heritage Council, that had widespread support and immediate success, when the aircraft were legally protected under a conservation order promulgated under the *Heritage of Western Australia Act 1990* (Fig. 5).

Finally, being the first of such sites subject to protection strategies and assessment within the full range of regional maritime sites generally, and the first subjected to an archaeological testing regime, the declaration of these sites under the *Heritage Act*, would see them regarded as a benchmark for similar remains in the waters of other Australian States. Other important Western Australian sites such as WCDR Charles Learmonth's Beaufort Bomber, lost off Fremantle in 1944 are already benefitting from the management lessons learned in the Broome instance.

30 THE WEST AUSTRALIAN **CLASSIFIEDS** FRIDAY DECEMBER 20 2002

Government of Western Australia
Heritage of Western Australia Act 1990

Conservation Order

Flying Boat Wreckage Site located in Roebuck Bay, Broome,

WHEREAS

In my opinion it is necessary and desirable to provide special protection in respect of a Flying Boat Wreckage Site in Broome, being that portion of seabed land located in Roebuck Bay, Broome as is now defined by Heritage Council of Western Australia survey drawing No 4859 as prepared by Fugro Spatial Solutions Pty Ltd, (and was defined in Schedule 1 of notice HR401 published in the Government Gazette on 25 October 2002 on page 5318) and situated in Roebuck Bay, Broome ("the place").

now pursuant to section 59(4) of the Heritage of Western Australia Act 1990 (the Act), I, Dr Judy Edwards, Minister for the Environment and Heritage, HEREBY PROHIBIT the demolition, damage or alteration of the place or any portion of the place, or any structure on the place.

DATED the 17th day of December 2002.

DR JUDY EDWARDS MLA
MINISTER FOR THE ENVIRONMENT AND HERITAGE

Figure 5. The conservation order.

Management options at submerged aircraft sites

Many modern management strategies have been developed as a result of understandings arising out of the lessons learned in the shipwreck case and in the case study outlined above. All such strategies are clearly inextricably linked to a climate of regional support and to legal considerations, both international and local. From the lessons learned at the shipwreck and submarine sites, and in a review of the reports and literature emanating from aviation sites, it is evident that some of the options available at aircraft wrecks within the framework of a formal management plan are:

(i) To do nothing on-site and to allow the wreck to decay naturally with a minimum of cultural interference. This is effected by relying solely on the protection of international agreements (between formerly warring parties for example), protective legislation or informal understandings (e.g. war graves legislation and international conventions in respect of the protection of ships and aircraft of State). In the case of aircraft containing human remains, as with the historic submarine, normally they are considered a grave or tomb. The respective military services and war graves departments will either seek to have the remains left *in situ* if they are under no threat, or to have them recovered and interred in the nearest gazetted war cemetery if there is a concern.

(ii) Where there is no threat to human remains, to proceed as in (i) above, but to facilitate access for eco-tourism, recreational or other reasons. The visitor could be provided with interpretive material and the wreck could be marked with a plaque set into the surrounding land or the sea-bed alongside with a view to the identification of the wreck and an explanation of its salient features. This could be followed by the production of interpretive materials of public, conservation and museological value in the form of books, maps and pamphlets.

(iii) To conduct a full non-disturbance site inspection study aimed at physically recording the external features of the wreck and its context according to traditional archaeological standards and to then proceed as in (i) or (ii) above, but with regular monitoring (Jung, in prep.).

(iv) Where after due deliberation an aircraft wreck is earmarked for possible raising, to perform a full pre-disturbance, physical, biological and electrochemical study such that an informed comment can be made as to the extent of corrosion, concretion and animal/plant growth on the site. A full understanding of the nature and effect of the soil or underwater sediments on which or in which the wreck lies is also required.

(v) The recovery of the remains be conducted in such a manner that material is not lost in the transit from the site (jungle, ice or sea-bed, for example) and that the pit from which the wreck has been recovered is fully examined as soon as possible after it has been removed. Great anger was expressed, for example, when one of Australia's most historic aircraft, *Kookaburra*, was recovered from an inland desert without this step being completed to the satisfaction of some stakeholders (Davis & Smith, 1980).

Conclusion

It is evident from the discussion above that historic wrecked aircraft lying on land or underwater have the

potential to provide technical, historical and technological information relative to the pursuit and the progress of aviation. They can also contain material of relevance to the people that flew in them as crew, and where relevant as passengers. This information can be gleaned both from the wreck and from an archival study focusing on its remains. The lost aircraft can also be a grave in the true sense of the word and where a crew has been lost, their very presence would normally render the wrecked aircraft inviolable unless there were strategic, religious or social imperatives to the contrary, and until the remains were properly attended to in accordance with the religious and funerary customs of the parent country—and/or the government/military policies of the country regarding human remains.

Above all it is evident that lost aircraft can be an archaeological site and that it needs to be treated accordingly.

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