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JAPANESE MAGNETIC COMPASSES

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Report 812

JAPANESE MAGNETIC COMPASSES

11 May 1944

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Report 812

JAPANESE MAGNETIC COMPASSES

Project No. GNS 463

11 May 1944

Submitted to

THE ENGINEER BOARD

Fort Belvoir, Virginia

and/or

The Chief of Engineers

U. S. Army

Washington, D. C.

FOR OFFICIAL ACTION

by

J. C. Cosby
Warrant Officer, U. S. Army
Fort Belvoir, Virginia

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JAPANESE MAGNETIC COMPASSES

I. DESCRIPTION OF THE ITEMS

1. General. This report covers the examination of two types of captured Japanese magnetic compasses; a liquid filled wrist compass and an ordinary pocket compass. The wrist compass is fairly well made. The case is aluminum alloy. Within the case is a sealed plastic capsule containing the needle and liquid. The pocket type compass is rather poorly made. The material used in the case is brass. These compasses were captured in the South Pacific area. The date of capture is unknown.

II. TECHNICAL FEATURES

2. (a) The wrist compass needle is liquid dampened. The graduations are in mils, the least direct reading being one hundred mils. The compass needle and the graduations are painted with a luminous activated paint for night use. However, the luminosity of this paint has disappeared, probably due to moisture. The liquid used in the capsule is a mixture of pine oil and alcohol (See Appendix A).

(b) The pocket compass is graduated in degrees, the least direct reading being three degrees. No provisions were made for dampening or for clamping the needle in this compass.

III. USE OF THE ITEMS OF EQUIPMENT

3. (a) The wrist compass was evidently used only as a marching compass as no provisions were made for sighting or for reading azimuths accurately. The condition of the compass indicates considerable service. It is very doubtful if this compass was satisfactory for use in the area in which it was captured as the case was very badly corroded due to moisture, and the capsule had a bubble large enough to render the compass useless. The bubble was probably caused by the rapid expansion of the liquid in high temperatures, forcing the liquid through the seal.

(b) The pocket compass appears to be a very cheaply made commercial type compass and may have been the personal property of some soldier. It would be of very little use as a military compass.

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IV. COMPARISON WITH AMERICAN EQUIPMENT

4. The Japanese wrist compass is generally similar to the wrist compass now being issued to U. S. Army troops. The Japanese pocket compass is roughly comparable to the old U. S. Army watch compass which is now obsolete.

5. Comparative sizes of American and Japanese compasses are shown below:

U.S. Wrist Compass		Japanese Wrist Compass	
Diameter	2.15 inch	Diameter	1.25 inch
Thickness	0.80 inch	Thickness	0.40 inch

U. S. Watch Compass		Japanese Pocket Compass	
Diameter	1.75 inch	Diameter	2.35 inch
Thickness	0.46 inch	Thickness	0.45 inch

6. (a) The design of the American made wrist compass allows an azimuth to be set on the compass by turning the outer ring of the compass case. This feature allows the desired azimuth to be indicated by turning the compass until the needle coincides with the reference mark on the cover glass, which turns with the outer ring. This desirable feature is lacking on the Japanese wrist compass. The capsules of the two compasses are very similar. The production problems would be practically the same for both compasses.

(b) The obsolete American watch compass has a means of raising and locking the needle off its pivot when the compass is not in use so as to protect the point of the pivot. It also has a hinged metal cover. The Japanese pocket compass has no method of locking the needle. Consequently, the accuracy of the compass is quickly impaired by damage to the needle bearing in transport. The Japanese compass has a removable metal cover.

7. The operating procedure for both the American and Japanese compasses of this type are practically the same since neither have any sighting arrangement.

8. The material used in the American made wrist compass seems more satisfactory for use in a compass of this type than the aluminum used in the Japanese compass due to the fact that it does not corrode.

FIG. 1. JAPANESE WRIST COMPASS, LIQUID-FILLED

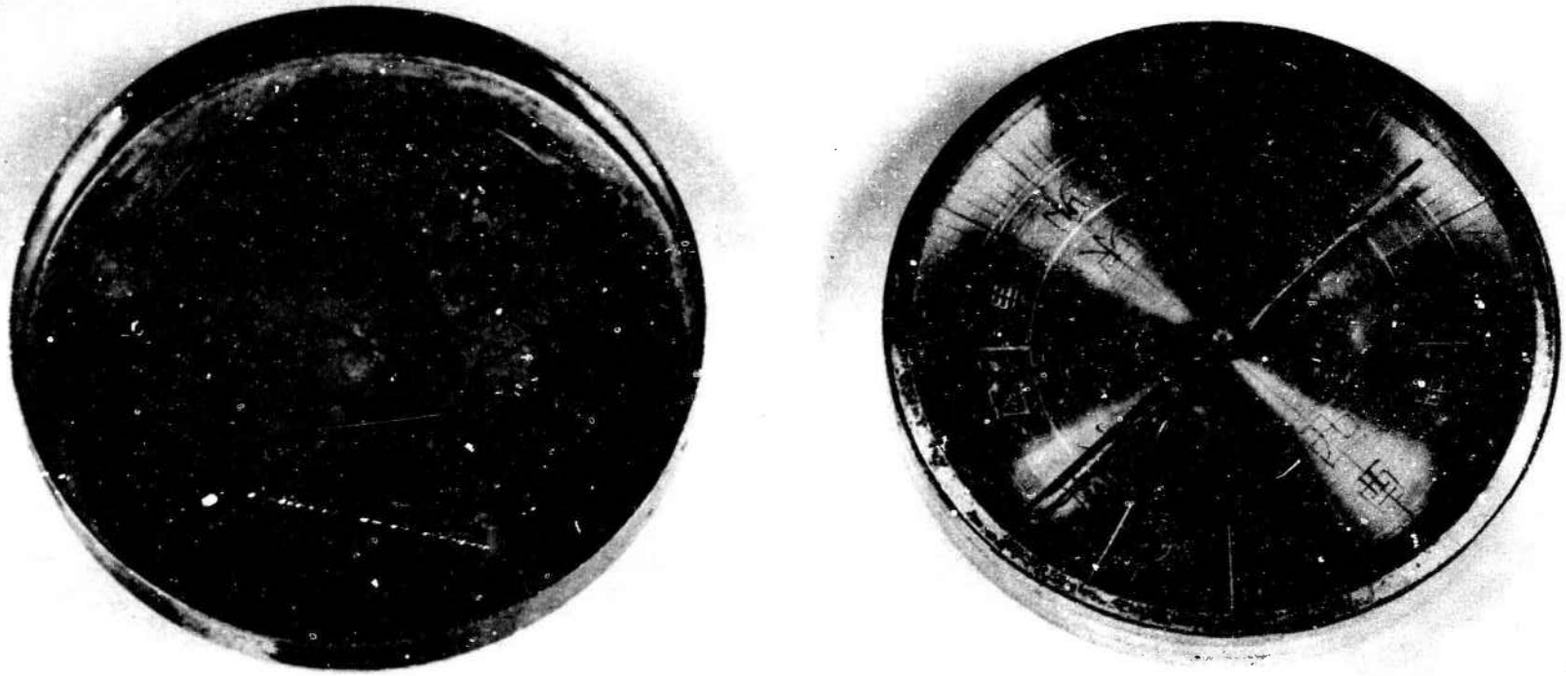

FIG. 2. JAPANESE POCKET COMPASS. View shows cover removed.

V. RECOMMENDATIONS

9. Since comparable types of American made magnetic compasses seem generally superior to the Japanese compasses examined, it is recommended that no further consideration be given to the Japanese compasses.

Submitted by:

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APPENDIX A

ANALYSIS OF LIQUID FROM JAPANESE WRIST WATCH

MATERIALS BRANCH
THE ENGINEER BOARD
FORT BELVOIR, VIRGINIA

IDENTIFICATION OF JAPANESE COMPASS LIQUID

Requisition No. 473 | Report No. 473-1

Requested by: Mapping Branch | Reference: Notebook No. 59

Project No. GNS 468 | 22 April 1944

I. SYLLABUS

1. The liquid taken from a captured Japanese compass was found to be similar in physical properties to a mixture of pine oil and alcohol.

II. AUTHORITY

2. The authority for this investigation is Engineer Board Project GNS, Examination of Enemy Equipment.

III. INVESTIGATION

A. Introduction.

3. This work was undertaken in order to identify the liquid removed from a captured Japanese wrist compass.

B. Procedure.

4. The refractive index was measured with an Abbe Refractometer. A freezing point determination was attempted at temperatures down to -50° F. The sample was examined for its miscibility with water, alcohol, and ether.

5. These physical constants were then compared for similarity to known materials for identification.

6. A mixture of pine oil and ethyl alcohol was prepared with the same refractive index as the compass liquid and then examined for miscibility with water, for smell, etc.

C. Results.

7. The comparison of the physical constants of the compass liquid with that of various known compounds is shown in the following table.

Name	Refractive Index at 20C	Melting Point (F)	Solubility Water	Solubility Alcohol	Solubility Ether
Compass liquid	1.4375	Below -50	Soluble	Soluble	Soluble
2-methyl-propanal oxime	1.4302	Below -112	Soluble	-	-
Biisopropenyl	1.4377	-85	-	-	-

8. The odor of the pine oil and alcohol mixture was very similar to that of the compass liquid. The pine oil and alcohol mixture, however, was found to be somewhat less soluble in water than the compass fluid.

9. There was not sufficient sample to make specific gravity, boiling range, flash point, and molecular weight determinations.

10. The difference in water solubility of the pine oil and alcohol mixture and the compass liquid may have been caused by the different source of supply for Japanese pine oil.

11. Pine oil is a thin liquid at normal temperatures but becomes viscous at low temperatures. The addition of alcohol increases the temperature range in which the pine oil remains thin.

V. CONCLUSIONS

12. The pine oil and alcohol mixture shows the greatest similarity to the compass liquid of any commonly available material.

VI. RECOMMENDATIONS

13. There are no recommendations.

Submitted by Roy W. Hill 1st Lt C.E.
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Forwarded by Arthur W. Van Heuckeroth
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Captain, Corps of Engineers,
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APPENDIX B

DEL :TIONS AS TO

JAPANESE ECONOMIC STATUS

DEDUCTIONS AS TO JAPANESE ECONOMIC STATUS

No deductions as to Japanese economic status are possible from the examination of the two compasses as the compasses did not have nameplates or any markings to indicate when or by whom they were made. No other Japanese compasses known to be manufactured before September 1939 are available for comparison.

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U.S. ARMY CORPS OF ENGINEERS, ENGINEER RESEARCH AND DEVELOPMENT LABS., FORT BELVOIR, VA. (REPORT 812)

JAPANESE MAGNETIC COMPASSES - AND APPENDIXES A AND B

J.C. COSBY 11 MAY '44 13PP. PHOTOS

NAVIGATION (29)
NAVIGATION INSTRUMENTS (7)

COMPASSES, MAGNETIC

19.

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