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All corr. to be addressed to
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Box 1424H, G.P.O.,
ADELAIDE.

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COMMONWEALTH OF AUSTRALIA

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WEAPONS RESEARCH ESTABLISHMENT,
(INC. L.R.W.E., C.P.R.L., H.S.A.L.)
SALISBURY, SOUTH AUSTRALIA.

7th March, 1955.

Wing Commander Berry,
Defence Signals Branch,
C/o Defence Registry,
Victoria Barracks,
MELBOURNE. Vic.

Aerial System for [REDACTED]

Attached is a copy of my suggestions which I am
sending to Barkel. I hope my interpretation of operational
needs is correct. If you do not agree we might discuss this
further.

G. de V. Gipps

(G. de V. Gipps)

ECP.

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AERIAL SYSTEM FOR

Following a visit to _____ on Monday 7th February, 1955 the aerial requirements for an intercept station there have been considered. This paper attempts to define the requirements and makes recommendations as to how these requirements should be met.

It is considered that at the present time any installation should be kept to the minimum required to carry out operational requirements. These requirements are interpreted as being search or cover of signals in the frequency range of about 3 to 10 Mc/s, originating anywhere on the Kra Peninsula or in surrounding territories to a distance of say 2000 miles from _____

It is assumed that _____ will not be required to intercept signals which are for various reasons difficult to receive in northern Malaya.

To meet these requirements it is necessary to provide "high angle" aerials which may be directional, to cover the peninsula and also "low angle" aerials to cover _____

These latter aerials must be omni directional if a large number of directional aerials is to be avoided. It also follows from the statement of requirements that high gain aerials are not at present required. If the need for high gain aerials is later determined then further consideration will have to be given to the use of ^{an} increased number of directional aerials.

High Angle.

The cover of the Peninsula can be achieved by using a half wave dipole aerial. Such an aerial has a broad figure of "8" polar diagram in the horizontal plane and should be placed with aerial wire axis at approximately 050°. Although such an aerial has a null in the direction of the wire it must not be assumed that a "blind" area will thus be produced. Such a blind area exists for ground wave conditions only. For high angles of reception this aerial is not nearly so directional as in the horizontal plane. At near vertical angles it has an almost

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circular polar diagram.

In order to cover the required frequency range the dipole must be either of a broad-band resonant or of a non-resonant type. In this case the latter has been chosen as it gives a greater frequency range and is easier to construct. A frequency coverage of 3 to 1 can be achieved by using a loaded, folded dipole. The use of one aerial then will provide coverage of the whole peninsula in the frequency range of 3 to 9 Mc/s provided a suitable height above ground can be chosen. The aerial height for high angle reception should be between $\frac{1}{4}$ and $\frac{3}{4}$ of a wave length at the operating frequency. This requirement can be satisfied here by placing the aerial at $\frac{1}{4}$ wavelength above ground for the lowest frequency. (3 Mc/s) In practice a height of 35 ft would be desirable as the effective height will be greater than the measured height as the radio wave penetrates some distance into the ground. The length for the dipole should be 90 ft.

The attached sketch shows the method of construction of the aerial. The feeder line impedance should be made equal to the load impedance. This can be done by making both 600 ohms when a two wire open transmission line can be used. Another simpler method of construction is to use 300 ohm "ribbon" transmission line for both line and aerial. The separation of the elements of the folded dipole is in this case the width of the ribbon. If open wire construction is used for the aerial the separation should be not more than 0.1 of a wavelength at the highest frequency. Much closer separations can however be used.

Low Angle.

The aerial described above has poor sensitivity for signals having small angles of arrival and in addition has undesirable directional properties at low angles. It is therefore necessary to provide an addition aerial for reception of signals from distances greater than about 500 miles.

The most suitable aerial for the present conditions

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is a wide band vertical monopole. A sketch of such an aerial is attached and dimensions given for a frequency range of 3 to 10 Mc/s. The impedance of this aerial is 70 ohms and it can best be used with a coaxial 70 ohm cable which should be buried to a depth of about 2 feet. In the diagram of the monopole aerial the lower cone elements are shown as rigid tubes (copper or stainless steel are suitable), it will probably be easier to use wire. In this case some alteration to the insulated wires will be necessary so that the cones retain their correct shape. The central mast may be wooden or steel and is insulated from the ground.

Dimensions are:-

Overall height 59.75 ft

Length of lower cone generating wire 18.25 ft

Length of upper cone generating wire 49.25 ft

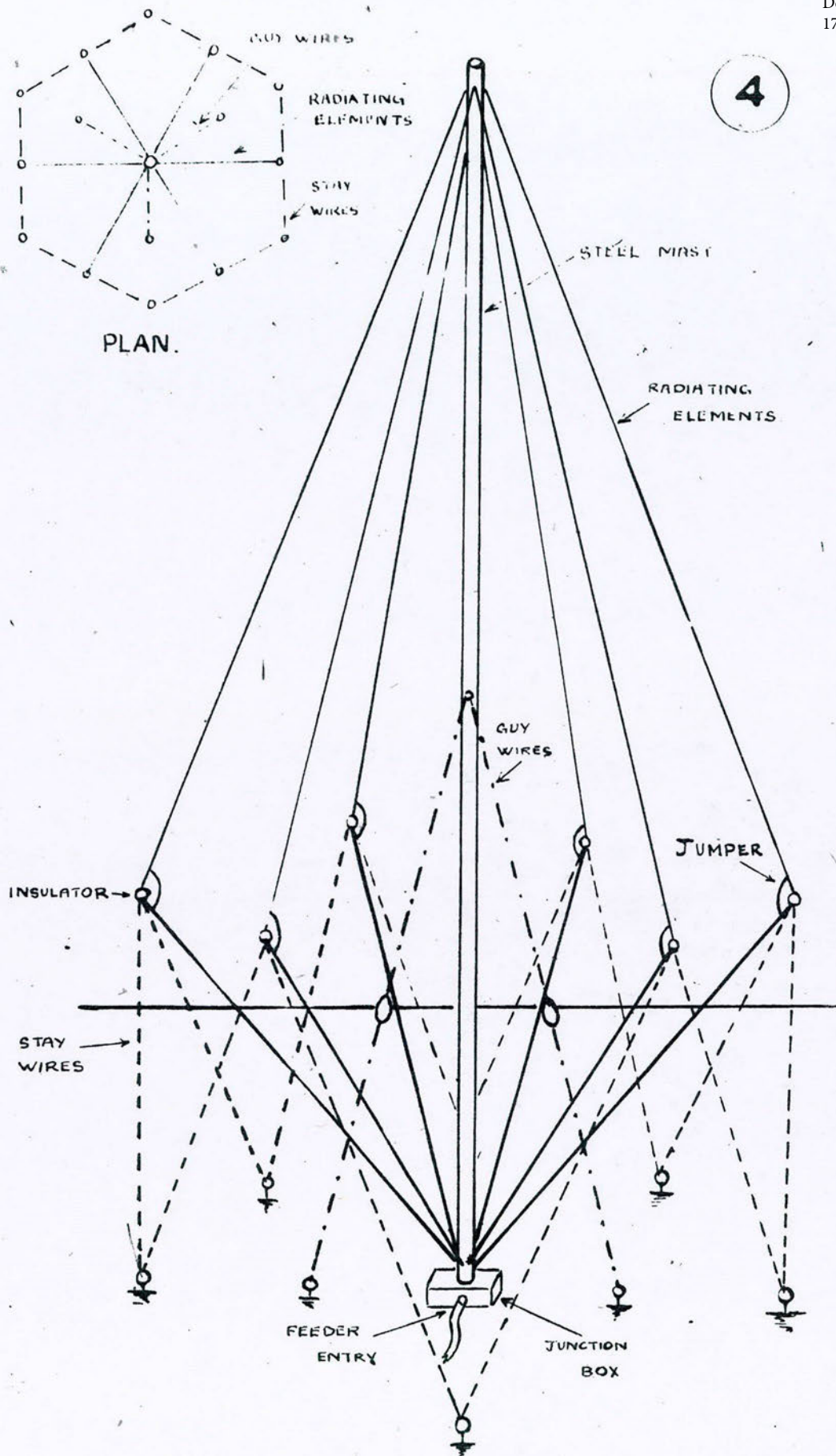
Height of lower cone apex above ground 0.75 ft.

Height of common cone base above ground 12.5 ft.

Radius of common cone base above ground 14.0 ft.

The two aeriels described satisfy all the initially stated requirements and should present little difficulty to build. It is desirable that they should be separated by a distance of 100 yards and should be a similar distance from other large metal obstacles. If required the separation between the aeriels may be reduced somewhat to suit local conditions.

					MATERIAL		
					SPECN.		
					FINISH		
					USED ON		
ISSUE No.	DATE	MOD. No.	AMENDMENT		APPROV.	PROJ'T No.	
SECURITY CLASSIFN.	COMMONWEALTH OF AUSTRALIA LONG RANGE WEAPONS EST. SALISBURY				<u>TITLE—</u>		
	DRAWN			SCALE	DRG. No.		Z
	TRACED						
	CHECKED						
	APPROVED						



GENERAL ARRANGEMENT OF A.S.R.E.
WIDE-BAND GROUNDED ~~WAVE~~ ^{MONOPOLE} AERIAL.
NOT TO SCALE.