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NPIC/R-1519/63

October 1963

PHOTOGRAPHIC INTERPRETATION REPORT

CUBAN INTERNATIONAL COMMUNICATION/BROADCAST STATIONS



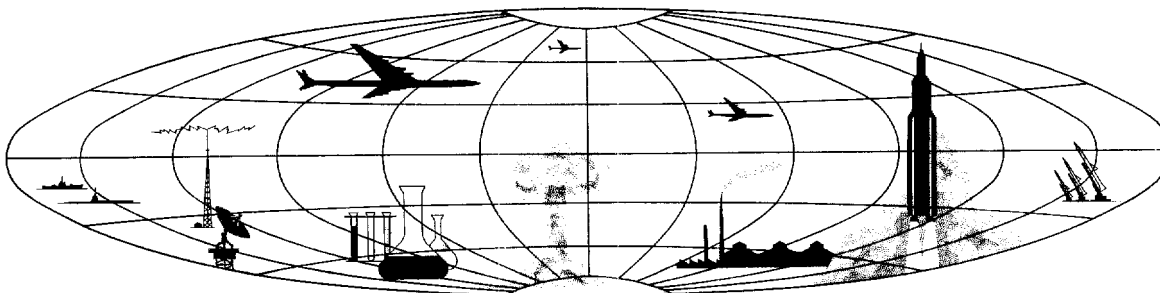
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PHOTOGRAPHIC INTERPRETATION REPORT

CUBAN INTERNATIONAL COMMUNICATION / BROADCAST STATIONS

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SUMMARY

Detailed analysis of the six international radio communication/broadcast stations detected on photographic coverage of Cuba through [] indicates the probability of a point-to-point communication/broadcast capa-

bility with Moscow, with nearly all of the capital cities of Central and South America, with many of the capital cities of Central Europe, and probably with certain countries of Central Africa.

INTRODUCTION

This study, made possible through the larger scale and greater detail of recent photography, presents precise data on the six presently known international radio stations in Cuba, including several previously unreported locations. All six are in the general area of Havana (Figure 1 and Table 1). A subsequent report is expected to cover internal Cuban communication facilities.

Utilizing the more comprehensive photographic coverage now available, not only can the approximate frequency range be estimated,** but it is also possible to align the antennas with such accuracy that in most cases the probable correspondent can be determined. Thus, of the majority of the 73 long-range antennas detected, the great circle projection of their orientation azimuth passes through a single capital city. Further, certain capitals, such as Moscow, are intersected by more than one antenna orien-

tation azimuth projection from more than one station. Therefore, it would appear that with few exceptions the stations operate on a point-to-point rather than general broadcast basis.

The information produced by this study is presented in graphical and tabular form. For each of the six stations reported on, there is 1) an annotated photograph (Figures 2 through 7); 2) a table of measurements and other data (Tables 2 through 7); and 3) a world map showing the probable correspondent of each antenna (Figures 8 through 13).

Generally, no distinction is made between those antennas used for radio communication and those used for radio broadcasting, as this function is not determinable from aerial photography, the sole source utilized in the preparation of this report. However, detailed examination did determine the design of the antennas to be such that they could be adapted to perform either function on the point-to-point basis mentioned above.

In addition, unless there is no doubt as to an antenna's directivity, the tables show both the forward and back (180 degree opposite) orienta-

*An additional location, detected on [] photography, appears as an addendum to this report.

**The method for calculating frequencies was derived from the rhombic antenna design chart, Figure 5-18, page 179, of The A.R.R.L. Antenna Book. 1/

NPIC/R-1519/63

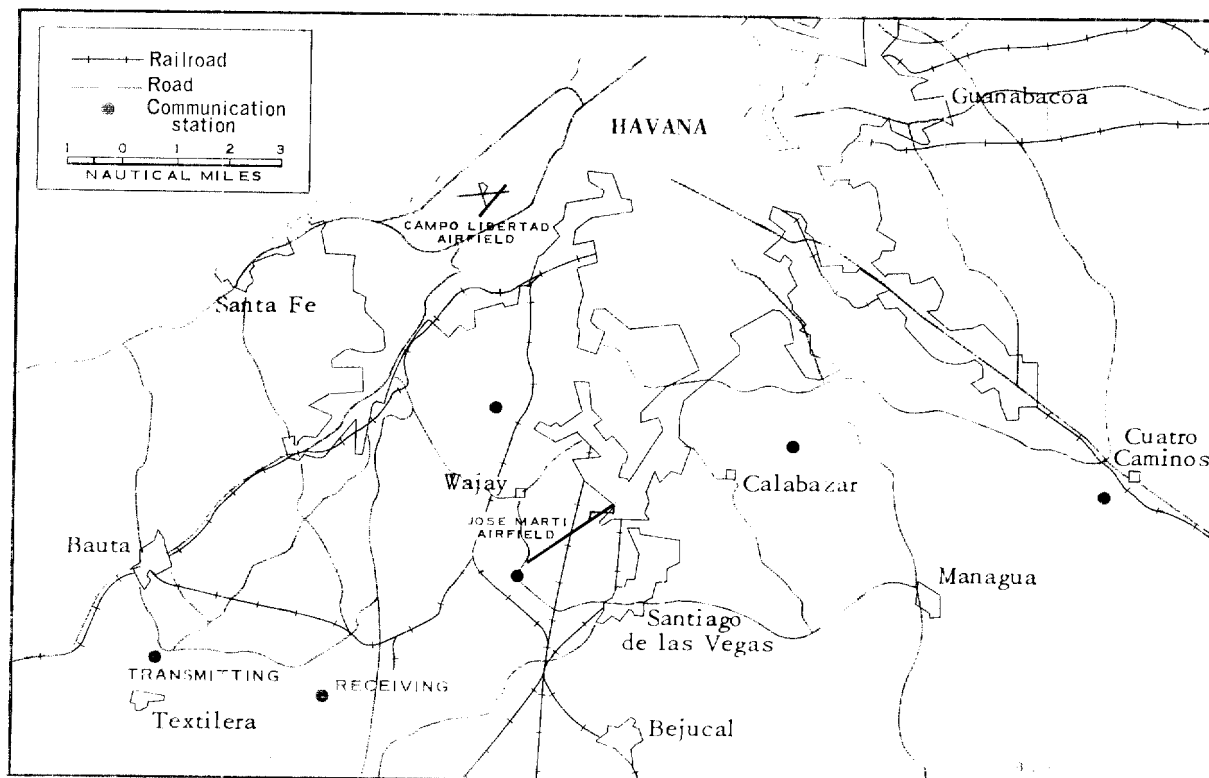


FIGURE 1. LOCATION OF INTERNATIONAL COMMUNICATION/BROADCAST STATIONS.

tion azimuths. This is necessary with many receiving rhombic antennas, for example, since there is no dissipation line and propagation could be off either end of the antenna. In such cases, no attempt was made through collateral intelligence to determine the actual correspondent, but the most likely entered in the forward projection

column as determined from photographic evidence alone. Thus, if an antenna is beamed in one direction through a field of other antennas, while the opposite end has a clear "field of fire," then the clear end will be shown as the forward projection entry unless some further consideration takes precedence.

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NPIC/R-1519/63

Table 1. Coordinates of Communication/Broadcast Stations

Station	Coordinates	Location
Bauta Transmitting	22-56-48N 82-32-42W	2.2 nm south of town, 14 nm SW of central Havana
Bauta Receiving	22-56-18N 82-29-24W	3.2 nm east of Bauta Transmitting Station
Calabazar	23-01-00N 82-20-00W	2.1 nm east of town
Santiago de las Vegas	22-58-36N 82-25-36W	Off SW end of Jose Marti Airfield, 2.1 nm WNW of town
Cuatro Caminos	23-00-15N 82-13-45W	0.6 nm west of town
Wajay	23-01-42N 82-26-00W	1.6 nm NNW of town, in SSW environs of Havana

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NPIC/R-1519/63

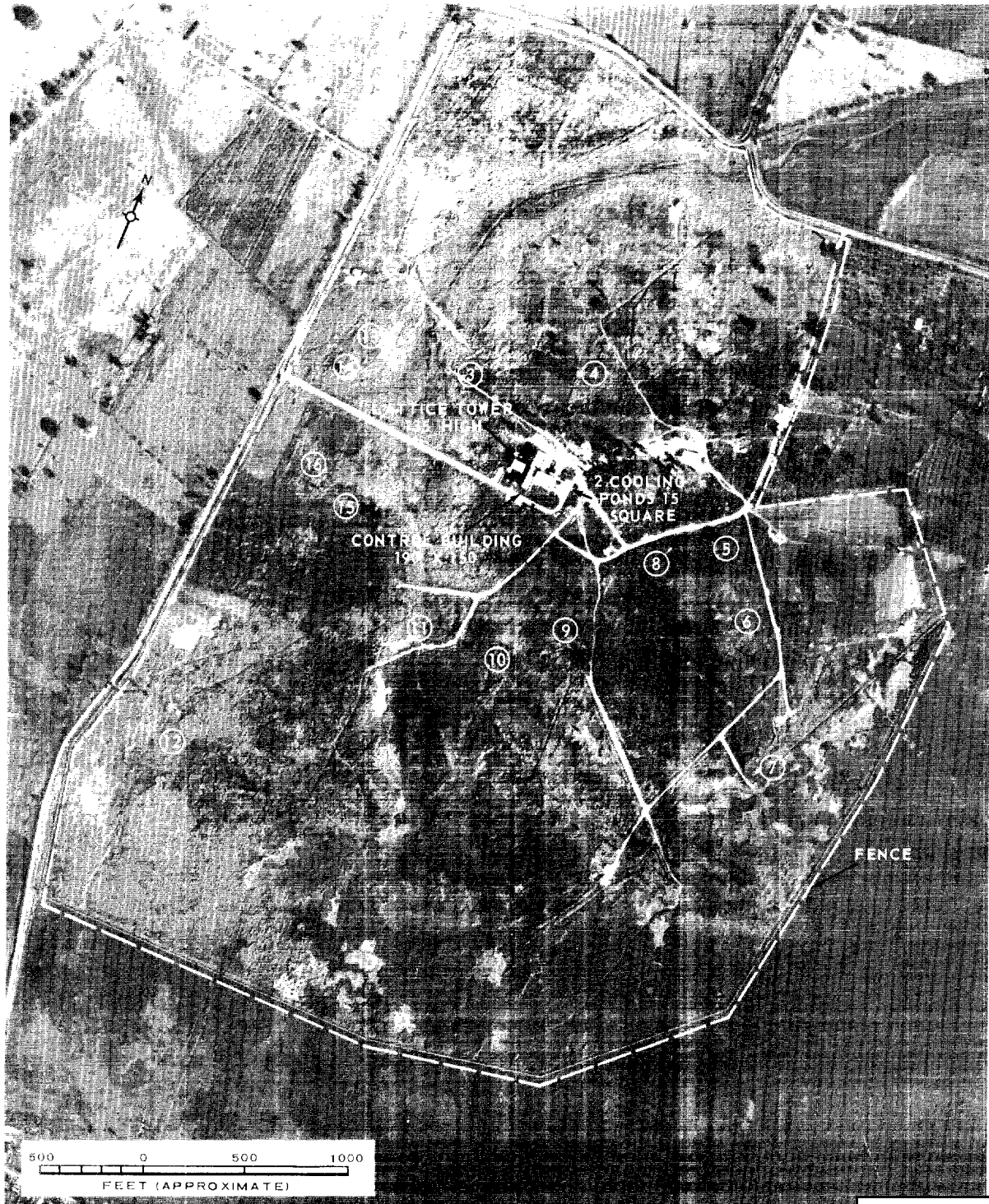


FIGURE 2. BAUTA TRANSMITTING STATION, [REDACTED] [REDACTED]

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NPIC/R-1519/63

Table 2. Technical Data, Banta Transmitting Station

Antenna		Axis				Leg Length		Tilt	Wave	Est WL	Azimuth	Prob Correspondents ¹	
No	Type	Major	Minor	ft	m	ft	m	Z	Z	per Leg	Back	Forward	Rear
		ft	m	ft	m	ft	m	est deg		Length	Azimuth ¹	Projection	Projection
1	Rhombic	660	205	250	76	360	110					Managua, Nicaragua	--
2	Rhombic	1,320	403	495	151	700	213					Bucharest, Rumania; Central Europe	Near Guatemala City
3	Rhombic	1,320	403	495	151	700	213					Odessa, USSR	None (near San Salvador)
4	Rhombic	1,320	403	495	151	700	213					Middle East	None
5	Double Rhombic	900	275	445	135	500	153					Odessa, USSR	None (near San Salvador)
6	Rhombic	900	275	445	135	500	153					Odessa, USSR	None (near San Salvador)
7 ²	Rhombic	1,000	305	485	148	350	167					Moscow, USSR	Tegucigalpa, Honduras
8	Rhombic	1,375	420	365	111	705	215					Caracas, Venezuela	--
9	Rhombic	1,250	381	445	135	675	205					Rio de Janeiro, Brazil	None (USA)
10	Rhombic	1,250	381	445	135	675	205					Bogota, Colombia	None (USA)
11	Rhombic	1,250	381	445	135	675	205					Panama City	None (USA)
12	Rhombic	860	262	410	125	485	148					Niamey, Niger (Africa)	Mexico City
13 ³	Hori-zontal Dipole	NA	NA	NA	NA	200	61					Santo Domingo, Dominican Republic	None
14 ³	Hori-zontal Dipole	NA	NA	NA	NA	140	43					Santo Domingo, Dominican Republic	None
15 ³	Hori-zontal Dipole	NA	NA	NA	NA	120	37					Panama City	None (USA)
16 ³	Hori-zontal Dipole	NA	NA	NA	NA	90	27					Panama City	None (USA)

NA - Not Applicable

¹See Figure 8 for world map projection of azimuths to probable correspondents.

²Under construction - poles not in.

³Assumed to be half wavelength antennas.

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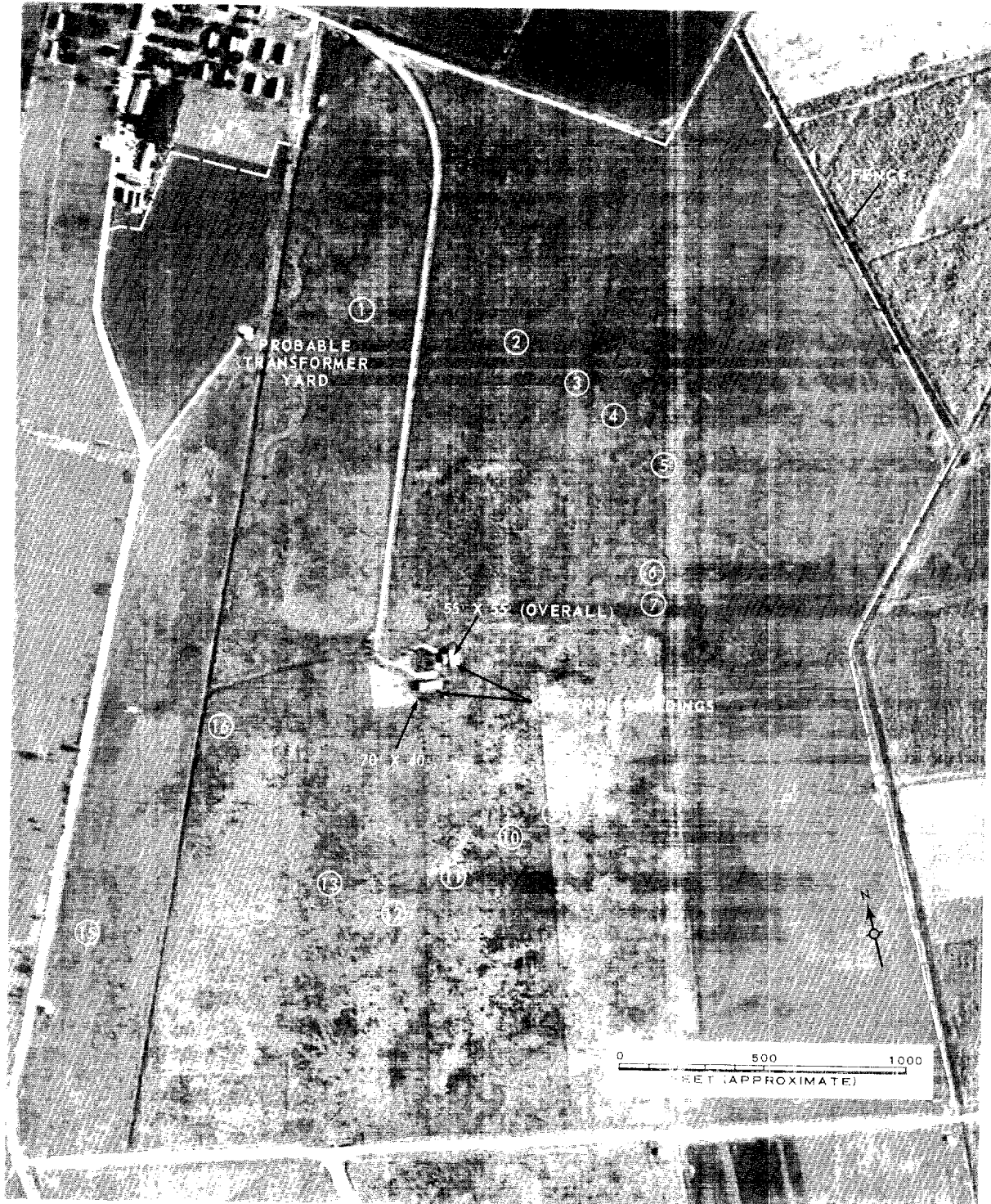


FIGURE 3. BAUTA RECEIVING STATION,

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NPIC/R-1519/63

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Table 3. Technical Data, Bauta Receiving Station

Antenna		Axis				Leg Length		Tilt	Wave	Est WL	Azimuth/ Back	Prob Correspondents ¹	
No	Type	Major	Minor			ft	m	L	L	per Leg	Azimuth ¹	Forward	Rear
		ft	m	ft	m			est	deg	Length	(°) (')	Projection	Projection
1	Rhombic	765	233	260	79	380	116					Managua, Nicaragua	--
2	Rhombic	765	233	260	79	380	116					Guatemala City	Bucharest, Rumania; Central Europe
3	Rhombic	765	233	260	79	380	116					Guatemala City	Bucharest, Rumania; Central Europe
4	Rhombic	765	233	260	79	380	116					Madrid, Spain	--
5	Rhombic	765	233	260	79	380	116					Madrid, Spain	--
6	Rhombic	765	233	260	79	380	116					San Juan, P. R.	--
7	Rhombic	765	233	260	79	380	116					Caracas, Venezuela	--
8	Rhombic	765	233	260	79	380	116					Rio de Janeiro, Brazil	None
9	Rhombic	765	233	260	79	380	116					Rio de Janeiro, Brazil	None (USA)
10	Rhombic	765	233	260	79	380	116					Bogota, Colombia	None (USA)
11	Rhombic	765	233	260	79	380	116					Bogota, Colombia	None (USA)
12	Rhombic	765	233	260	79	380	116					Bogota, Colombia	None (USA)
13	Rhombic	765	233	260	79	380	116					Panama City	None (USA)
14	Rhombic	765	233	260	79	380	116					Panama City	None (USA)
15	Rhombic	765	233	260	79	380	116					Quito, Ecuador; Lima, Peru	None (USA)
16	Rhombic	765	233	260	79	380	116					Mexico City	Naimey, Niger (Africa)

¹See Figure 9 for world map projection of azimuths to probable correspondents.

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NPIC/R-1519/63

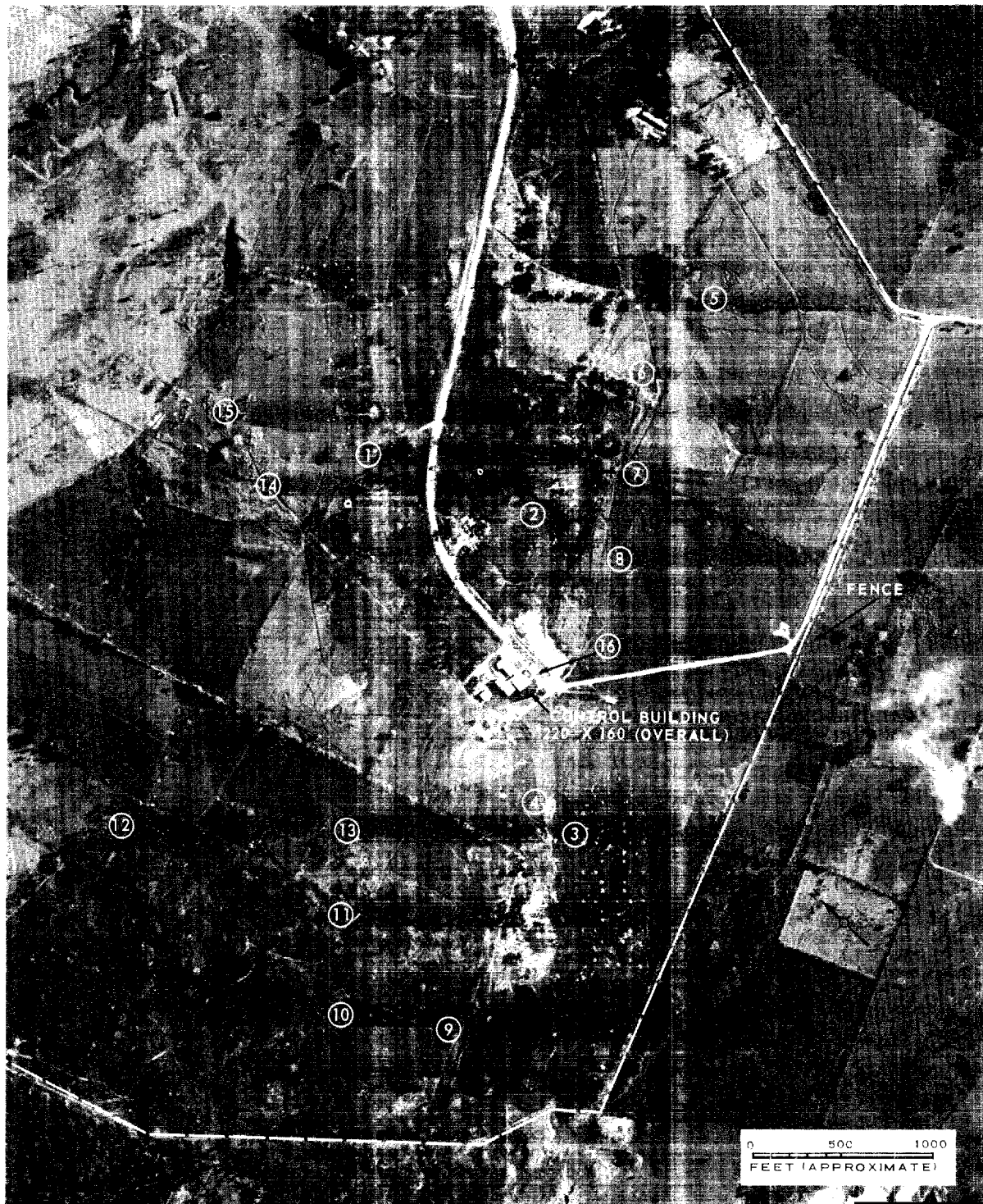


FIGURE 4. CALABAZAR RECEIVING STATION, [REDACTED] [REDACTED]

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NPIC/R-1519/63

Table 4. Technical Data, Cclabazar Receiving Station

Antenna		Axis				Leg Length		Tilt	Wave	Est WL per Leg Length	Azimuth/ Back Azimuth ¹ (°) (')	Prob. Correspondents ¹	
No	Type	Major ft	Minor m	Major ft	Minor m	ft	m	°	est deg			Forward Projection	Rear Projection
1	Fish-bone	960	292									Moscow, USSR	Tegucigalpa, Honduras
2	Fish-bone	960	292									Odessa, USSR	--
3	Fish-bone	960	292									Odessa, USSR	--
4	Fish-bone	960	292									Moscow, USSR	Tegucigalpa, Honduras
5	Rhombic	955	292	420	128	525	160					Rio de Janeiro, Brazil	None (USA)
6	Rhombic	1,140	349	420	128	600	183					Barranquilla, Colombia; Asuncion, Paraguay	None (USA)
7	Rhombic	955	292	420	128	525	160					Bogota, Colombia	None (USA)
8	Rhombic	955	292	420	128	525	160					Panama City	None (USA)
9	Rhombic	955	292	420	128	525	160					Niamey, Niger (Africa)	Mexico City
10	Rhombic	955	292	420	128	525	160					Rio de Janeiro, Brazil	None (USA)
11	Rhombic	955	292	420	128	525	160					Bogota, Colombia	None (USA)
12	Rhombic	900	275			490	150					Odessa, USSR	--
13	Rhombic	955	292	420	128	525	160					Panama City	None (USA)
14	Rhombic	1,140	349	420	128	600	183					Bogota, Colombia	None (USA)
15	Rhombic	955	292	420	128	525	160					Odessa, USSR	--
16	Self-supporting lattice tower with yagi-type microwave											NA	NA

¹See Figure 10 for world map projection of azimuths to probable correspondents.

²Pole spacing, front to back.

³Pole spacing, side to side.

NPIC/R-1519/63



FIGURE 5. SANTIAGO DE LAS VEGAS RECEIVING STATION.

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NPIC/R-1519/63

Table 5. Technical Data, Santiago de las Vegas Receiving Station

Antenna		Axis				Leg Length		Tilt	Wave	Est WL per Leg Length	Azimuth/ Back Azimuth ¹ (°) (')	Prob. Correspondents ¹	
No	Type	Major ft	Minor m	Major ft	Minor m	ft	m	°	est deg			Forward Projection	Rear Projection
1	Rhombic	710	216	260	79	380	116					Tegucigalpa, Honduras	Moscow, USSR
2	Rhombic	710	216	260	79	380	116					Guatemala City	Bucharest, Rumania; Central Europe
3	Rhombic	710	216	260	79	380	116					Lisbon, Portugal	None
4	Rhombic	600	183	220	67	320	97					Mexico City	Niamey, Niger (Africa)
5	Rhombic	710	216	260	79	380	118					San Juan, P. R.	--
6	Rhombic	710	216	260	79	380	118					Caracas, Venezuela	--
7	Rhombic	710	216	260	79	380	118					Rio de Janeiro, Brazil	None (USA)
8	Rhombic	710	216	260	79	380	118					Caracas, Venezuela	--
9	Rhombic	710	216	260	79	380	118					Rio de Janeiro, Brazil	None (USA)
10	Rhombic	710	216	260	79	380	118					La Paz, Bolivia	--
11	Rhombic	710	216	260	79	380	118					La Paz, Bolivia	--
12	Rhombic	600	183	220	67	320	97					Panama City	--
13	Rhombic	600	183	220	67	320	97					San Juan, P. R.	--
14	Rhombic	600	183	220	67	320	97					Lisbon, Portugal	None
15	Rhombic	600	183	220	67	320	97					Guatemala City	Bucharest, Rumania; Central Europe
16	Rhombic	600	183	220	67	320	97					Tegucigalpa, Honduras	Moscow, USSR

¹See Figure 11 for world map projection of azimuths to probable correspondents.

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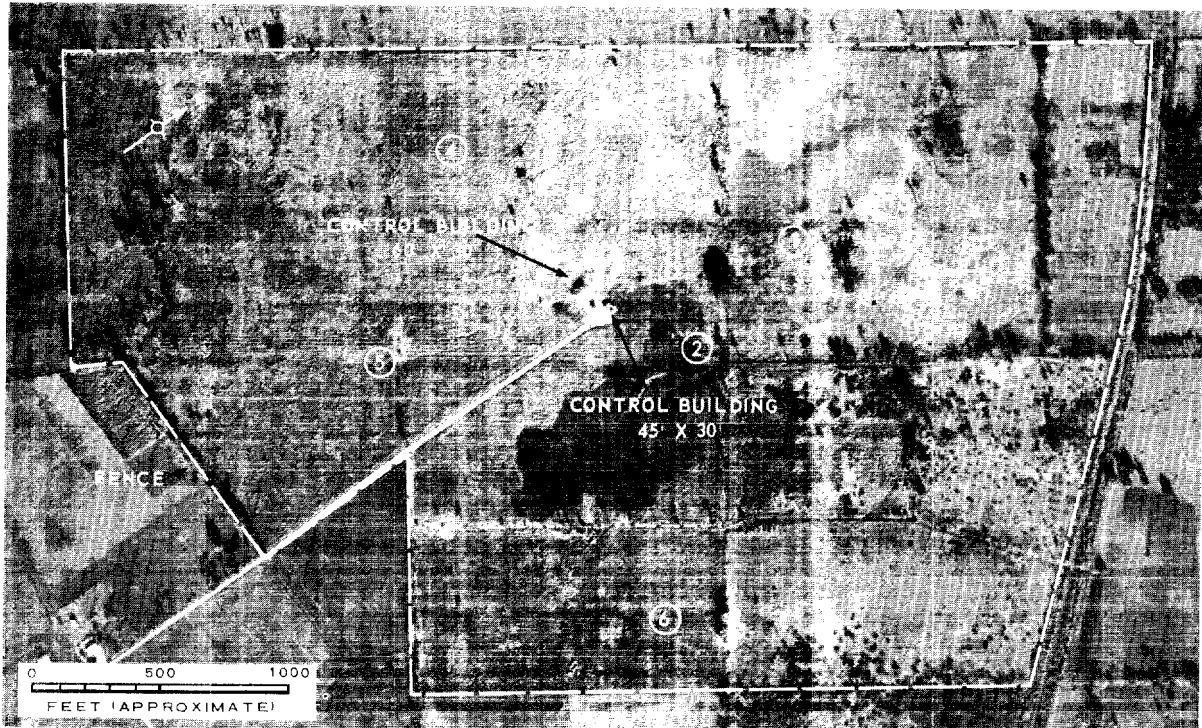


FIGURE 6. CUATRO CAMINOS RECEIVING STATION, [REDACTED]

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FIGURE 7. WAJAY TRANSMITTING AND RADIO BROADCAST STATION, [REDACTED]

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NPIC/R-1519/63

Table 6. Technical Data, Cuatro Caminos Receiving Station

Antenna		Axis				Leg Length		Tilt Z est deg	Wave Z est deg	Est WL per Leg Length	Azimuth/ Back Azimuth ¹ (°) (')	Prob Correspondents ¹	
No	Type	Major ft	Major m	Minor ft	Minor m	ft	m					Forward Projection	Rear Projection
1	Rhombic	860	262	250	73	440	134					Tegucigalpa, Honduras	Moscow, USSR
2	Rhombic	725	221			400	119					Guatemala City	Bucharest, Rumania; Central Europe
3	Rhombic	725	221	270	82.5	400	119					La Paz, Bolivia	--
4	Fish- bone, 2 bays wide	320	98									Panama City	--
5	Fish- bone, 2 bays wide	320	98									San Salvador	Northern Europe
6	Fish- bone, 2 bays wide	320	98									San Salvador	Northern Europe

¹See Figure 12 for world map projection of azimuths to probable correspondents.²Pole spacing, front to back.³Pole spacing, side to side.

Table 7. Technical Data, Wajay Transmitting and Radio Broadcast Station

Antenna		Axis				Leg Length		Tilt Z est deg	Wave Z est deg	Est WL per Leg Length	Azimuth/ Back Azimuth ¹ (°) (')	Prob Correspondents ¹	
No	Type	Major ft	Major m	Minor ft	Minor m	ft	m					Forward Projection	Rear Projection
1	Rhombic	700	214	270	65	380	116					Guatemala City	Bucharest, Rumania; Central Europe
2	Rhombic	700	214	270	65	380	116					Guatemala City	Bucharest, Rumania; Central Europe
3	Direc- tive (2 vertical radia- tors ²)	NA	NA	NA	NA	360	110					Central America ³	

¹See Figure 13 for world map projection of azimuths to probable correspondents.²Guyed, steel-lattice construction, approximately 300 ft high.³Projecting beam patterns, both end-fire and broadside to a line joining the antennas, intersect no specific city, either local or distant. However, a beamwidth pattern of approximately 40 degrees would give good general coverage of Guatemala, El Salvador, Honduras, Nicaragua, and Costa Rica.

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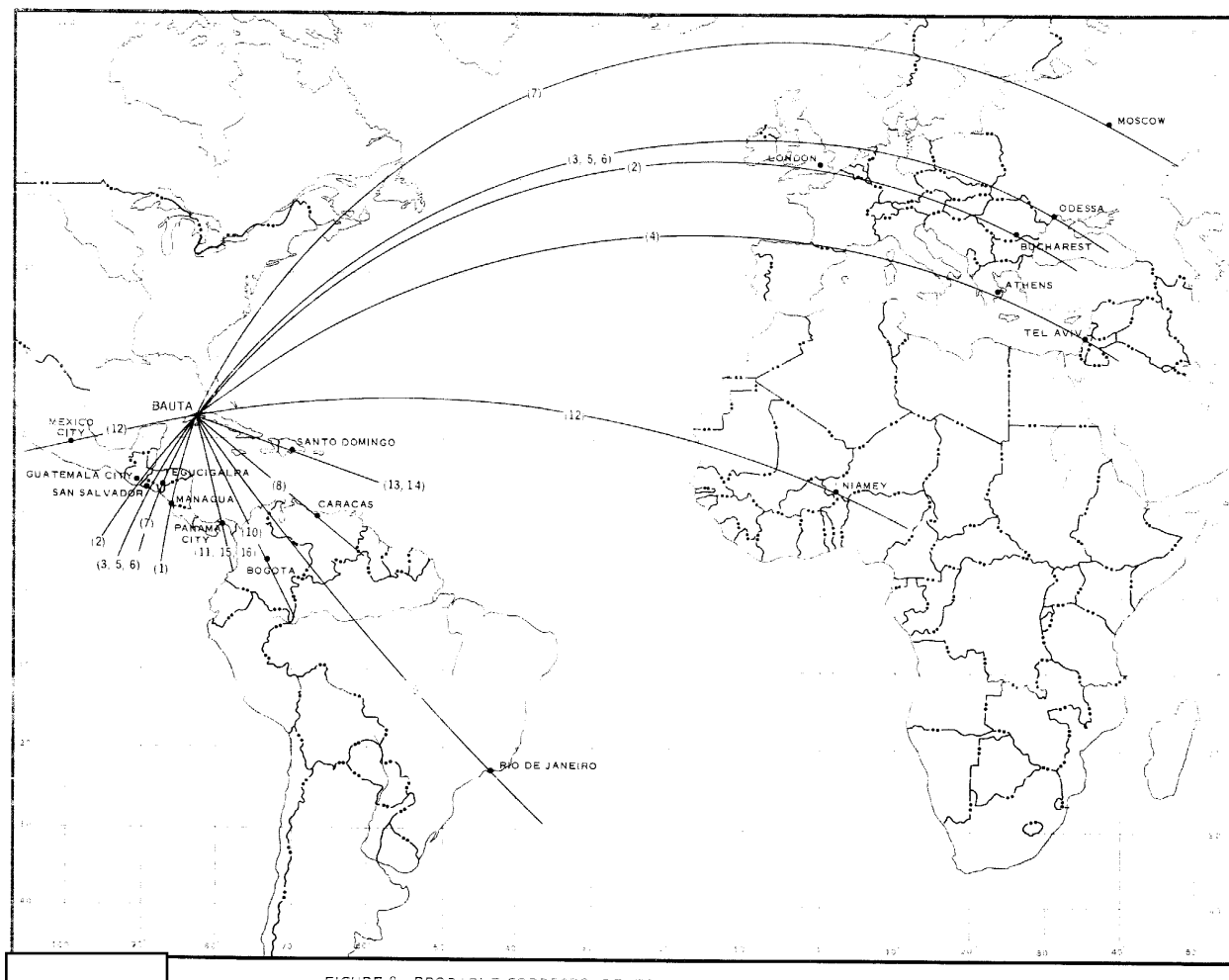


FIGURE 8. PROBABLE CORRESPONDENTS, BAUTA TRANSMITTING STATION.

NPIC/R-1519/63

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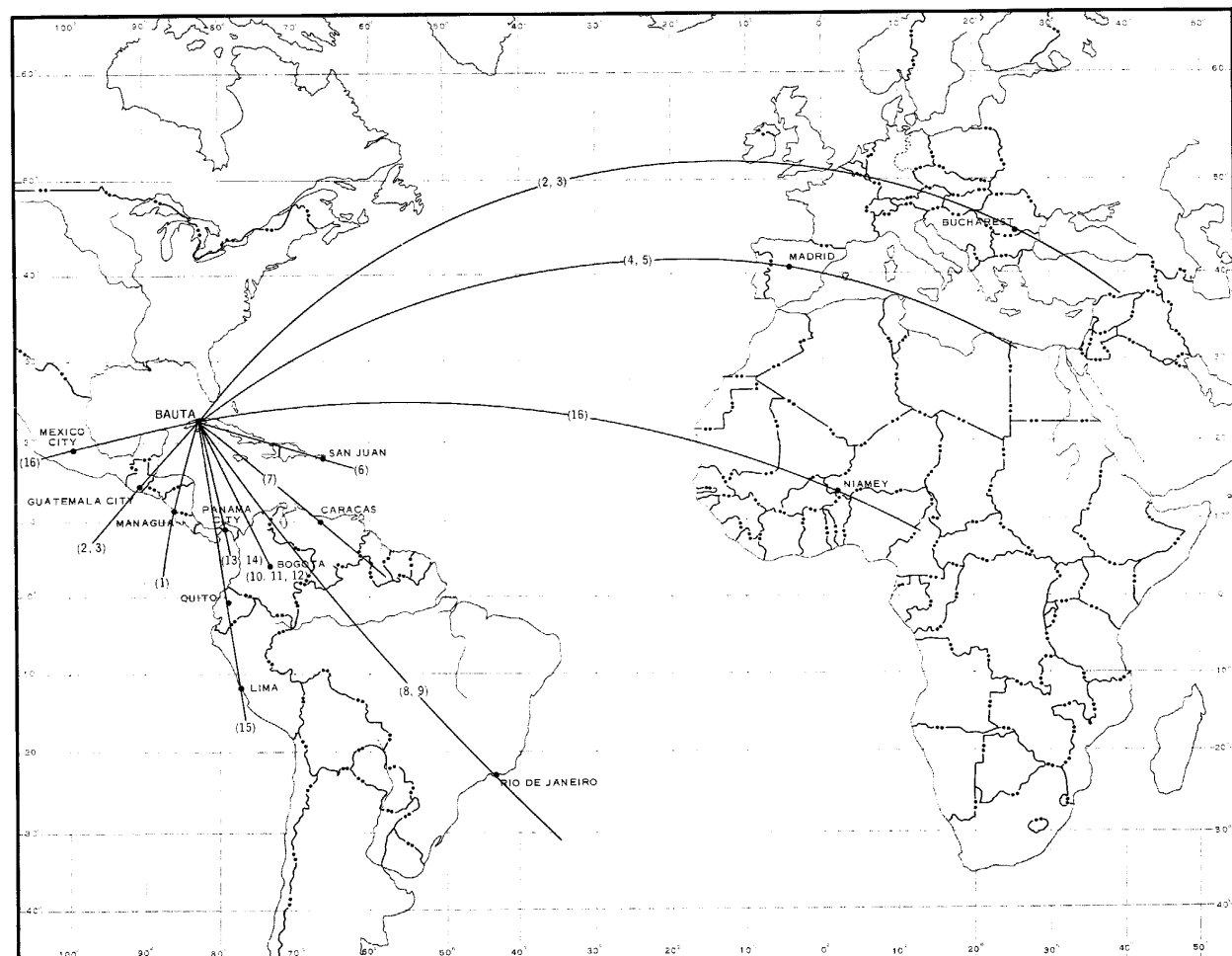


FIGURE 9. PROBABLE CORRESPONDENTS, BAUTA RECEIVING STATION.

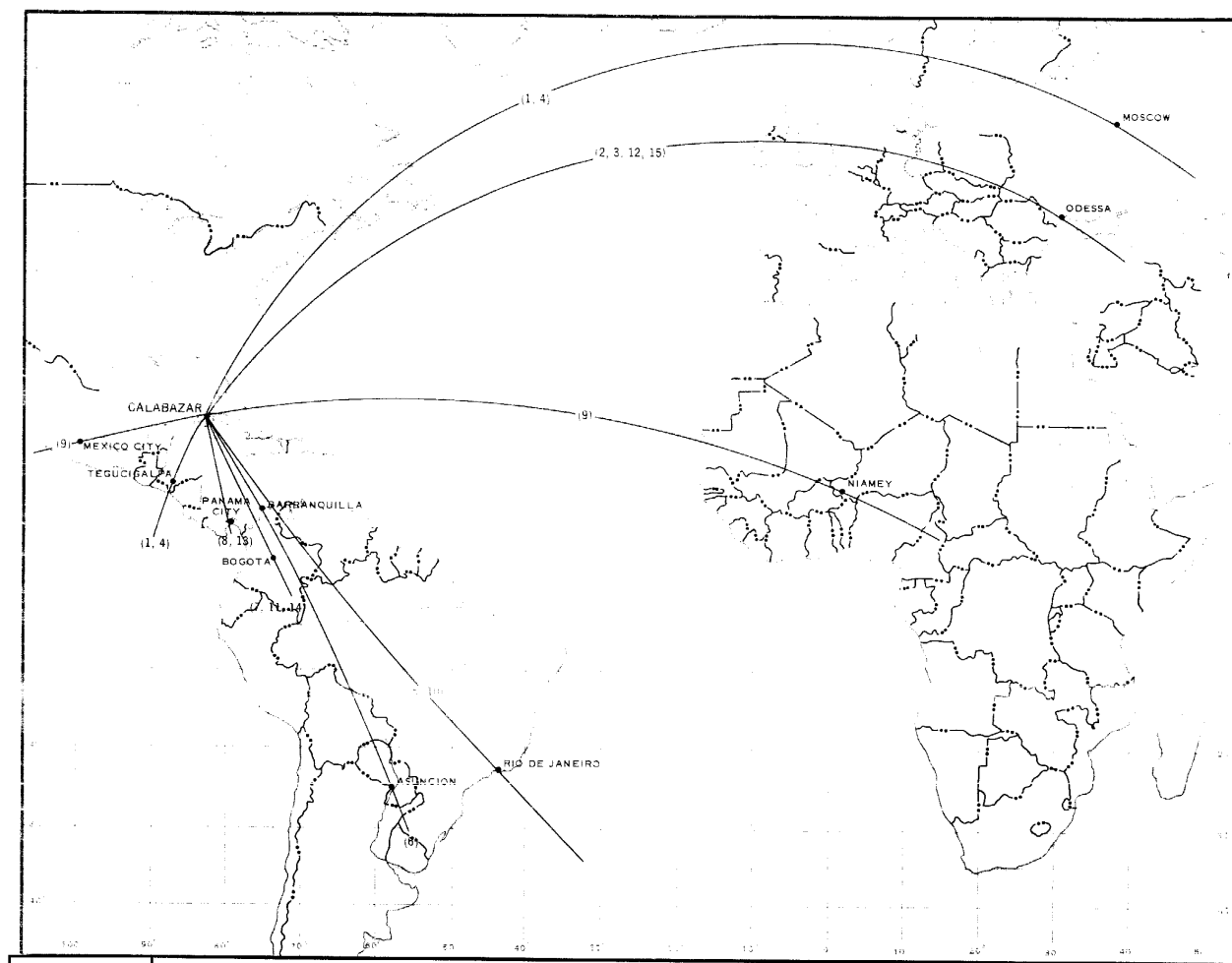
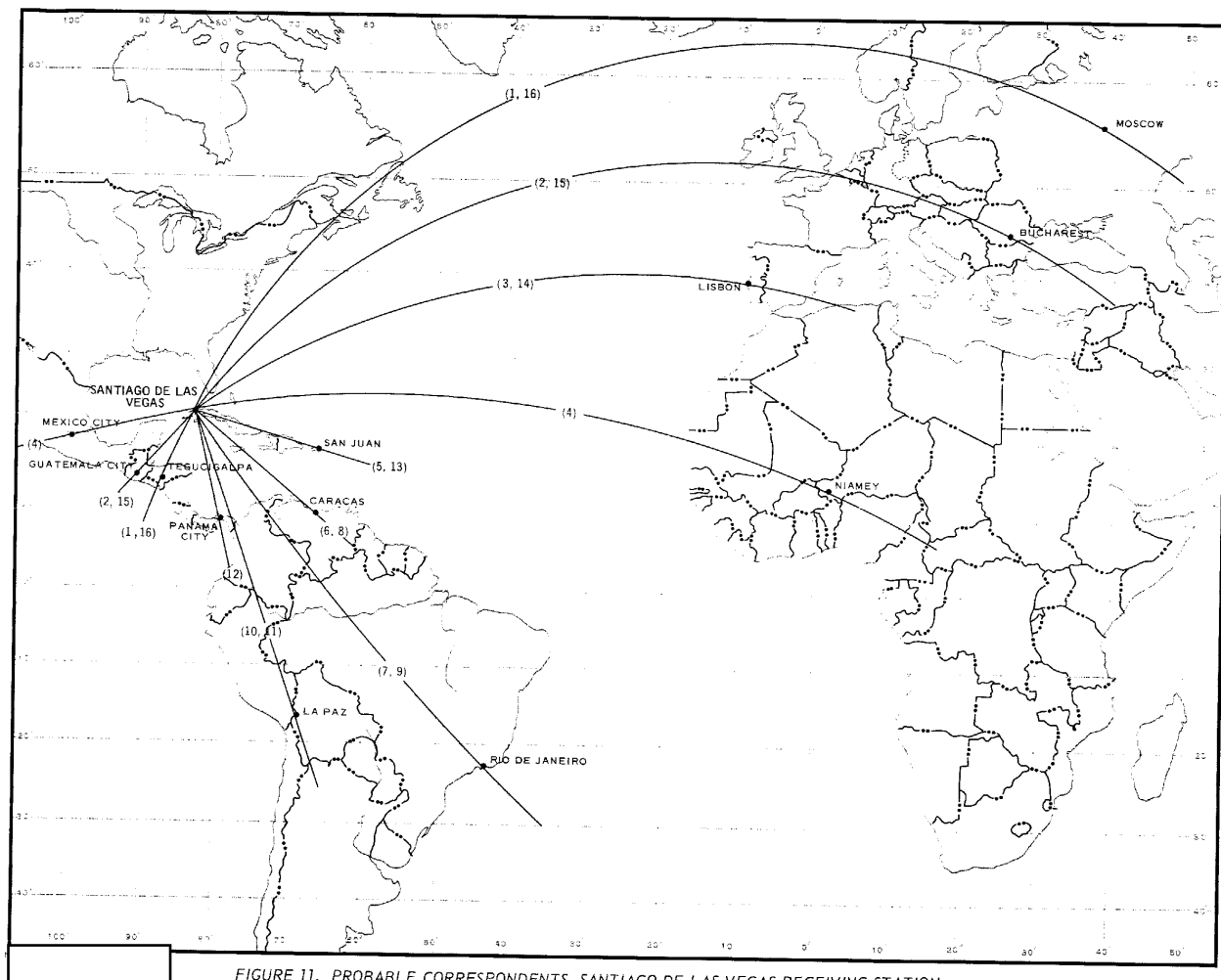


FIGURE 10. PROBABLE CORRESPONDENTS, CALABAZAR RECEIVING STATION.

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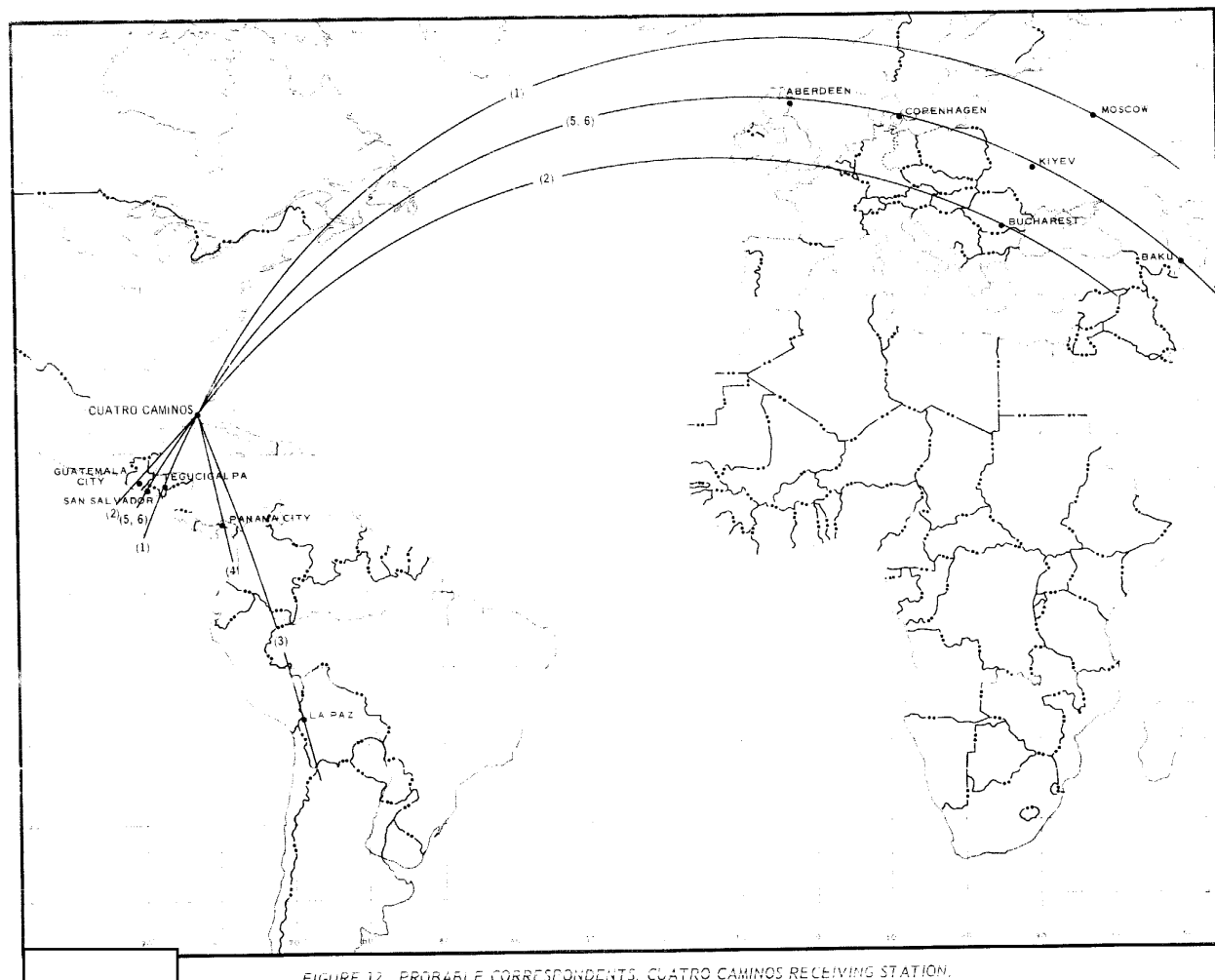


FIGURE 12. PROBABLE CORRESPONDENTS, CUATRO CAMINOS RECEIVING STATION.

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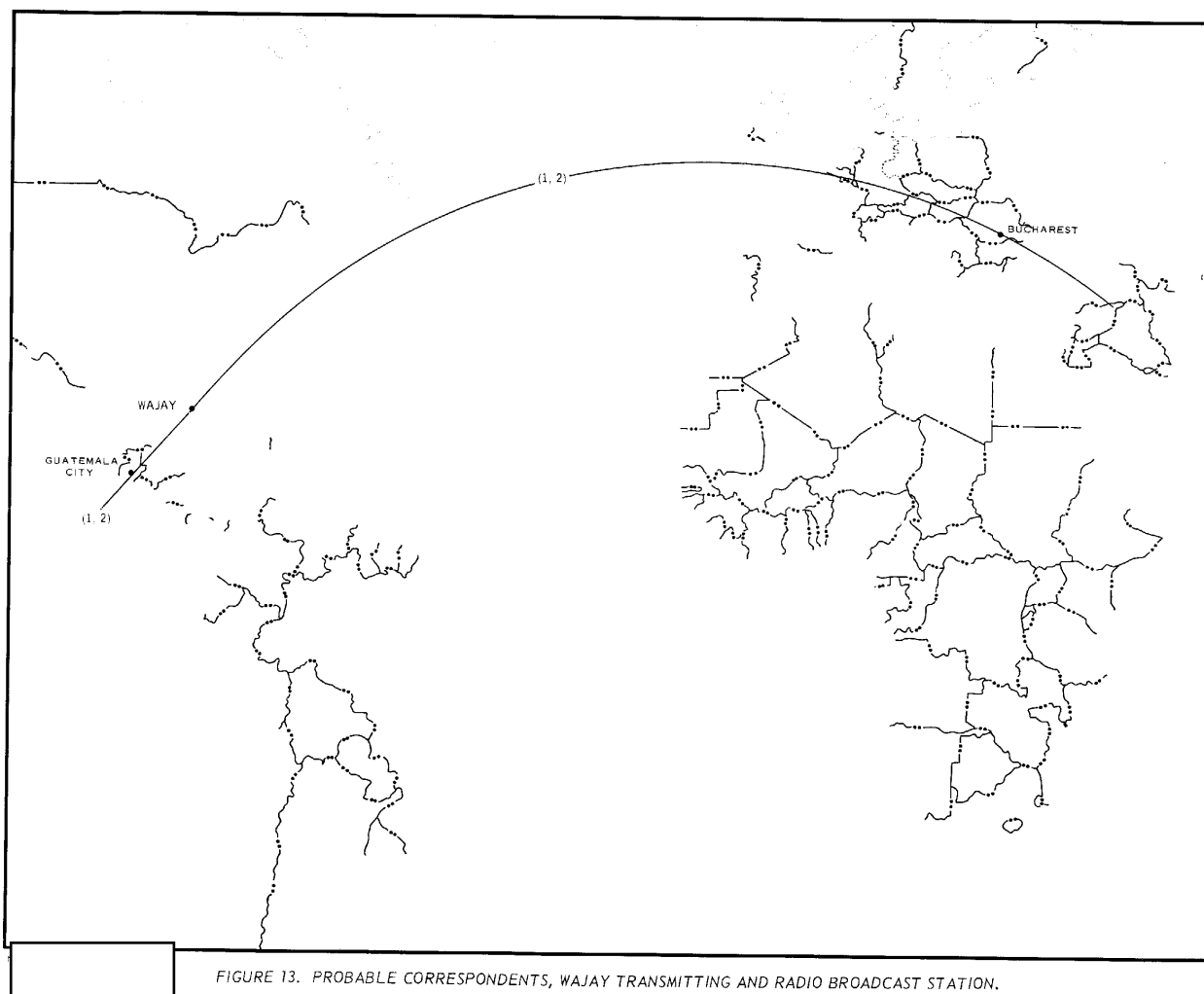


FIGURE 13. PROBABLE CORRESPONDENTS, WAJAY TRANSMITTING AND RADIO BROADCAST STATION.

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ADDENDUM

On photography of [redacted] a rhombic antenna farm was observed under construction at 22-52-12N 82-20-00W, 4.7 nautical miles southeast of Bejucal.

Though no poles are in place, a distinct double rhombic pattern was identified on [redacted] photography, and a second double rhombic pattern was present 5 days later.* Ground scars in the area indicate that other antennas will be erected. It appears that the site will be a transmitting facility.

Detailed characteristics of the antennas have not been fully determined as yet. However, the forward orientation azimuth projection of both antennas passes through Odessa, USSR, and the rear projection through San Salvador.

The following approximate preliminary measurements have been made:

Antenna Number	Major Axis (feet)	Minor Axis (feet)	Leg Length (feet)
1	[redacted]	550	600
2		675	610

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REFERENCES

PHOTOGRAPHY



25X1

MAPS OR CHARTS

Bauta Transmitting Station

AMS Series E723, Sheet 3684I, 3d ed, Sep 60, scale 1:50,000 (UNCLASSIFIED)

Bauta Receiving Station

AMS Series E723, Sheet 3784IV, 3d ed, no date, scale 1:50,000 (UNCLASSIFIED)

Calabazar Receiving Station

AMS Series E723, Sheet 3785III, 3d ed, no date, scale 1:50,000 (UNCLASSIFIED)

Santiago de las Vegas Receiving Station

AMS Series E723, Sheet 3784IV, 3d ed, no date, scale 1:50,000 (UNCLASSIFIED)

Cuatro Caminos Receiving Station

AMS Series E723, Sheet 3785II, 4th ed, Nov 62, scale 1:50,000 (UNCLASSIFIED)

Wajay Transmitting and Broadcast Station

AMS Series E723, Sheet 3785III, 3d ed, no date, scale 1:50,000 (UNCLASSIFIED)

DOCUMENT

1. American Radio and Relay League. The A. R. R. L. Antenna Book, 1949 (UNCLASSIFIED)



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