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*SEARCH AND RESCUE*  
Manual

*Vol. II:*  
*Planning Handbook*

U.S. Coast Guard  
COMDTINST M16120.6

Department of the Army  
FM 20-150

Department of the Navy  
NWP-19

Department of the Air Force  
AFM 64-2

1 August 1986

Parameter Change	Requires/Permits				
	POD	S	No. of Search Units	Size of Search Area	Search Duration
Increase POD Decrease POD	N/A N/A	Decrease Increase	Increase Decrease	Decrease Increase	Increase Decrease
Increase S Decrease S	Decrease Increase	N/A N/A	Decrease Increase	Increase Decrease	Decrease Increase
Increase No. of Search Units Decrease No. of Search Units	Increase Decrease	Decrease Increase	N/A N/A	Increase Decrease	Decrease Increase
Increase Search Area Size Decrease Search Area Size	Decrease Increase	Increase Decrease	Increase Decrease	N/A N/A	Increase Decrease
Increase Search Duration Decrease Search Duration	Increase Decrease	Decrease Increase	Decrease Increase	Increase Decrease	N/A N/A

Figure 5-15. Relationship Between Track Spacing and Other Search Planning Parameters

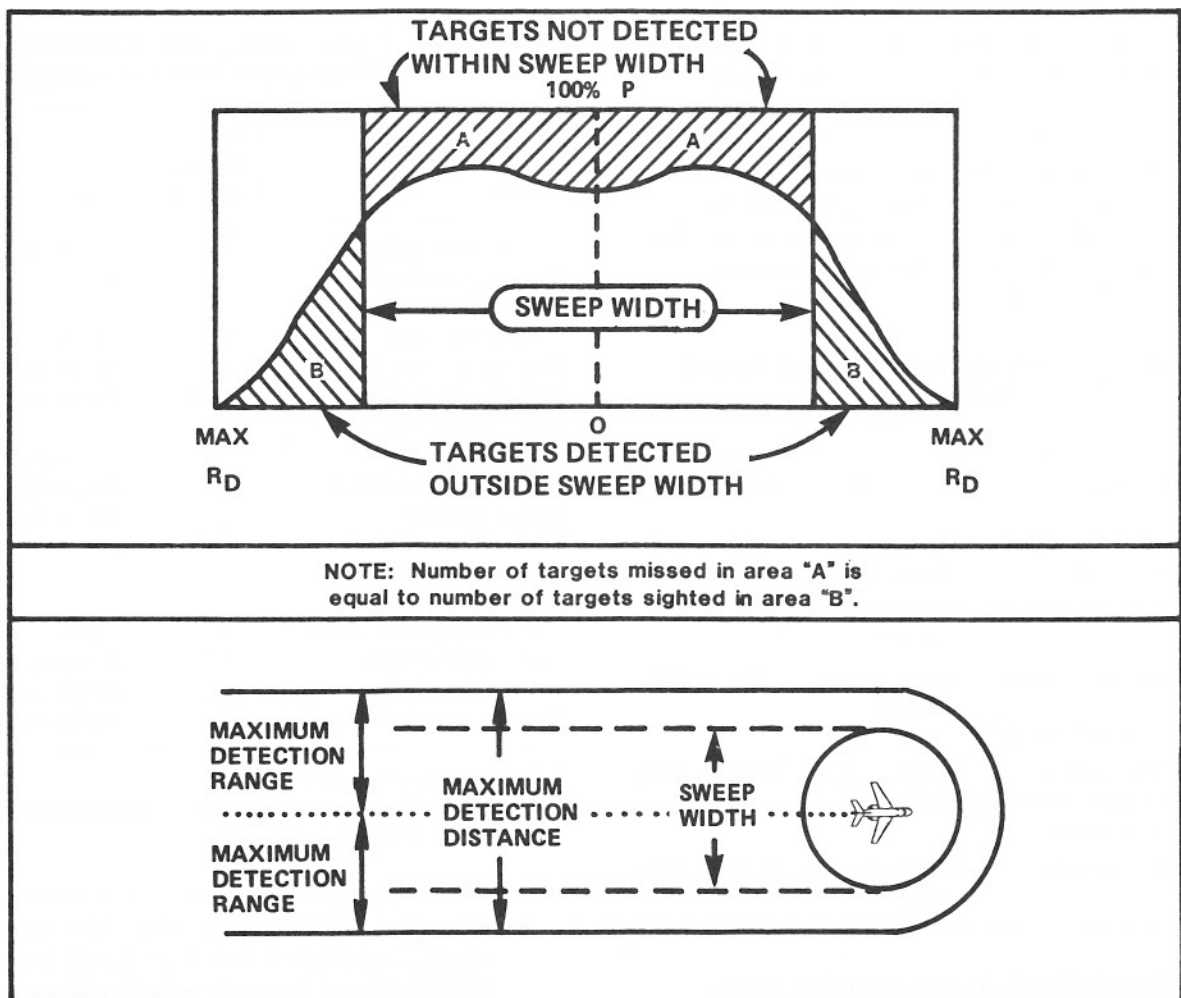


Figure 5-16. Sweep Width

**TABLE 4-9. Uncorrected Visual Sweep Width—Helicopters Altitudes 2500–3000 feet**

Helicopter Searching For	Altitude 2500 (ft) Visibility (NM)							Altitude 3000 (ft)* Visibility (NM)						
	1	3	5	10	15	20	30	1	3	5	10	15	20	30
Person in Water	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Raft 1 person	0.1	0.8	1.1	1.6	1.8	1.8	1.8	0.1	0.7	1.0	1.5	1.8	1.8	1.8
Raft 4 person	0.2	1.1	1.6	2.3	2.7	3.0	3.0	0.1	1.0	1.6	2.3	2.7	3.0	3.0
Raft 6 person	0.2	1.3	1.9	2.8	3.3	3.7	3.7	0.1	1.2	1.9	2.8	3.3	3.7	3.7
Raft 8 person	0.2	1.4	2.1	3.1	3.6	4.0	4.0	0.1	1.3	2.1	3.1	3.6	4.0	4.0
Raft 10 person	0.2	1.5	2.2	3.3	3.9	4.3	4.3	0.1	1.4	2.2	3.3	3.9	4.3	4.3
Raft 15 person	0.2	1.7	2.5	3.6	4.3	4.8	5.4	0.2	1.6	2.4	3.7	4.4	4.9	5.5
Raft 20 person	0.3	1.8	2.7	4.1	4.9	5.5	6.3	0.2	1.7	2.7	4.1	5.0	5.6	6.3
Raft 25 person	0.3	1.9	2.9	4.4	5.3	6.0	6.9	0.2	1.9	2.9	4.4	5.4	6.0	6.9
Power Boat <15 ft	0.2	1.2	1.7	2.3	2.6	2.8	2.8	0.1	1.1	1.7	2.3	2.7	2.9	2.9
Power Boat 15–25 ft	0.3	2.0	3.0	4.6	5.5	6.2	6.2	0.2	2.0	3.0	4.6	5.6	6.3	6.3
Power Boat 25–40 ft	0.4	2.5	4.0	6.5	8.1	9.3	11.1	0.2	2.5	4.0	6.5	8.2	9.4	11.2
Power Boat 40–65 ft	0.4	3.0	5.2	9.3	12.4	14.9	18.8	0.3	3.0	5.2	9.3	12.5	15.0	18.8
Power Boat 65–90 ft	0.4	3.2	5.7	10.9	15.1	18.6	24.1	0.3	3.1	5.7	10.9	15.1	18.6	24.1
Sail Boat 15 ft	0.3	1.9	2.8	4.2	5.1	5.6	5.6	0.2	1.9	2.8	4.3	5.1	5.7	5.7
Sail Boat 20 ft	0.3	2.2	3.3	5.1	6.3	7.1	7.1	0.2	2.1	3.3	5.2	6.3	7.1	7.1
Sail Boat 25 ft	0.4	2.5	3.8	6.1	7.6	8.7	8.7	0.2	2.4	3.9	6.1	7.7	8.8	8.8
Sail Boat 30 ft	0.4	2.7	4.3	7.1	9.0	10.5	12.6	0.2	2.6	4.3	7.1	9.1	10.6	12.7
Sail Boat 40 ft	0.4	2.9	4.9	8.7	11.5	13.7	17.0	0.3	2.9	4.9	8.7	11.5	13.7	17.1
Sail Boat 50 ft	0.4	3.1	5.3	9.6	12.9	15.6	19.7	0.3	3.0	5.3	9.7	13.0	15.6	19.7
Sail Boat 65–75 ft	0.4	3.1	5.6	10.5	14.3	17.5	22.4	0.3	3.1	5.6	10.5	14.4	17.5	22.5
Sail Boat 75–90 ft	0.4	3.2	5.7	11.1	15.4	18.9	24.6	0.3	3.1	5.7	11.1	15.4	19.0	24.7
Ship 90–150 ft	0.4	3.3	6.0	12.2	17.5	22.0	29.4	0.3	3.2	6.0	12.2	17.5	22.0	29.5
Ship 150–300 ft	0.4	3.3	6.3	13.6	20.4	26.6	37.4	0.3	3.3	6.3	13.6	20.4	26.6	37.4
Ship >300 ft	0.5	3.4	6.4	14.3	22.2	29.8	43.9	0.3	3.3	6.4	14.3	22.2	29.8	43.9

\* Visual searches are seldom conducted from altitudes above 3000 feet; however, for altitudes up to 5000 feet where visibility exceeds 3NM and target size exceeds 25 feet, the sweep widths given for 3000 feet remain applicable.

**TABLE 4-10. Uncorrected Visual Sweep Width—Vessels and Small Boats**

Search Object	Vessel SRU (90' WPB) Visibility (NM)						Small Boat SRU (41' UTB) Visibility (NM)					
	1	3	5	10	15	20	1	3	5	10	15	20
Person in Water	0.3	0.4	0.5	0.5	0.5	0.5	0.2	0.2	0.3	0.3	0.3	0.3
Raft 1 person	0.9	1.8	2.3	3.1	3.4	3.7	0.7	1.3	1.7	2.3	2.6	2.7
Raft 4 person	1.0	2.2	3.0	4.0	4.6	5.0	0.7	1.7	2.2	3.1	3.5	3.9
Raft 6 person	1.1	2.5	3.4	4.7	5.5	6.0	0.8	1.9	2.6	3.6	4.3	4.7
Raft 8 person	1.1	2.5	3.5	4.8	5.7	6.2	0.8	2.0	2.7	3.8	4.4	4.9
Raft 10 person	1.1	2.6	3.6	5.1	6.1	6.7	0.8	2.0	2.8	4.0	4.8	5.3
Raft 15 person	1.1	2.8	3.8	5.5	6.5	7.2	0.9	2.2	3.0	4.3	5.1	5.7
Raft 20 person	1.2	3.0	4.1	6.1	7.3	8.1	0.9	2.3	3.3	4.9	5.8	6.5
Raft 25 person	1.2	3.1	4.3	6.4	7.8	8.7	0.9	2.4	3.5	5.2	6.3	7.0
Power Boat <15 ft	0.5	1.1	1.4	1.9	2.1	2.3	0.4	0.8	1.1	1.5	1.6	1.8
Power Boat 15–25 ft	1.0	2.0	2.9	4.3	5.2	5.8	0.8	1.5	2.2	3.3	4.0	4.5
Power Boat 25–40 ft	1.1	2.5	3.8	6.1	7.7	8.8	0.8	1.9	2.9	4.7	5.9	6.8
Power Boat 40–65 ft	1.2	3.1	5.1	9.1	12.1	14.4	0.9	2.4	3.9	7.0	9.3	11.1
Power Boat 65–90 ft	1.2	3.2	5.6	10.7	14.7	18.1	0.9	2.5	4.3	8.3	11.4	14.0
Sail Boat 15 ft	1.0	1.9	2.7	3.9	4.7	5.2	0.8	1.5	2.1	3.0	3.6	4.0
Sail Boat 20 ft	1.0	2.2	3.2	4.8	5.9	6.6	0.8	1.7	2.5	3.7	4.6	5.1
Sail Boat 25 ft	1.1	2.4	3.6	5.7	7.0	8.1	0.9	1.9	2.8	4.4	5.4	6.3
Sail Boat 30 ft	1.1	2.7	4.1	6.8	8.6	10.0	0.9	2.1	3.2	5.3	6.6	7.7
Sail Boat 40 ft	1.2	3.0	4.9	8.5	11.2	13.3	0.9	2.3	3.8	6.6	8.6	10.3
Sail Boat 50 ft	1.2	3.1	5.2	9.4	12.5	15.0	0.9	2.4	4.0	7.3	9.7	11.6
Sail Boat 65–75 ft	1.2	3.2	5.5	10.2	13.9	16.9	0.9	2.5	4.2	7.9	10.7	13.1
Sail Boat 75–90 ft	1.2	3.3	5.7	10.8	15.0	18.4	0.9	2.5	4.4	8.3	11.6	14.2
Ship 90–150 ft	1.8	3.3	6.0	12.0	17.1	21.5	1.4	2.5	4.6	9.3	13.2	16.6
Ship 150–300 ft	1.8	3.4	6.3	13.4	20.1	26.1	1.4	2.6	4.9	10.3	15.5	20.2
Ship >300 ft	1.8	3.4	6.4	14.1	21.8	29.2	1.4	2.6	4.9	10.9	16.8	22.5

**TABLE 4-11. Weather Condition Factor**

Target Type	Winds > 15 kts	Winds > 25 kts
	Seas 2-3 ft	Seas > 4 ft
Person in water, or <30-ft Length Boat	0.5	0.25
Other Targets	0.9	0.9

**C. Correcting for Fatigue.** If feedback from on scene SRUs indicates search crews were excessively fatigued, reduce sweep width values by 10 percent (multiply by 0.9).

**D. Correcting for Search Aircraft Speed Correction.** Enter the speed correction table (Table 4-12) with aircraft type (fixed-wing or helicopter) and the speed flown. Read down the column to the search object. This value is the speed correction. Interpolate as required. There is no speed correction for surface SRUs.

**422 Visual Detection Aids****A. Daylight****TABLE 4-13. Visual Sweep Width Estimates for Daylight Detection Aids**

Device	Estimated Sweep Width (NM)	SRU Type
Red/orange balloon	0.5	Air or surface
Orange flight suit	0.5	Air
Red hand flare (500 candlepower) <sup>a</sup>	0.5	Air or surface
Day/night flare	0.5	Air or surface
Red pen gun flare	0.75	Air or surface
Red/orange flag (3 ft × 3 ft) <sup>a</sup>	1.0	Air or surface
Red reflective paulin	2.0	Air or surface
Tracer bullets	2.0	Air or surface
Green dye marker <sup>b</sup>	2.0	Air
Red meteor (star) or parachute <sup>a</sup> flare (10,000 candlepower)	4.0	Air or surface
Sun signal mirror	5.0	Air or surface
White parachute	5.0	Air or surface
Orange smoke <sup>a,c</sup>	6.0	Air or surface

<sup>a</sup> These estimates were derived from test data collected only on surface searches.

<sup>b</sup> Greatly reduced in heavy seas.

<sup>c</sup> Applies in winds under 6 knots only; degrades to less than 2 NM in winds over 10 knots.

**TABLE 4-12. Search Aircraft Speed Correction Table**

Search Object	Fixed-Wing Speed (knots)			Helicopter Speed (knots)			
	150 or less	180	210	60	90	120	140
Person in water . . . . .	1.2	1.0	0.9	1.5	1.0	0.8	0.7
Raft—1 to 4 man . . . . .	1.1	1.0	0.9	1.3	1.0	0.9	0.8
Raft—6 to 25 man . . . . .	1.1	1.0	0.9	1.2	1.0	0.9	0.8
Power Boat—to 25 ft . . . . .	1.1	1.0	0.9	1.2	1.0	0.9	0.8
Power Boat—25 to 40 ft . . . . .	1.1	1.0	0.9	1.1	1.0	0.9	0.9
Power Boat—40 to 65 ft . . . . .	1.1	1.0	1.0	1.1	1.0	0.9	0.9
Power Boat—65 to 90 ft . . . . .	1.1	1.0	1.0	1.1	1.0	1.0	0.9
Sail Boat—to 26 ft . . . . .	1.1	1.0	0.9	1.2	1.0	0.9	0.9
Sail Boat—30 to 52 ft . . . . .	1.1	1.0	1.0	1.1	1.0	0.9	0.9
Sail Boat—65 to 90 ft . . . . .	1.1	1.0	1.0	1.1	1.0	1.0	0.9
Ship—over 90 ft . . . . .	1.0	1.0	1.0	1.1	1.0	1.0	0.9



**B. Night****TABLE 4-14. Visual Sweep Width Estimates for Night Detection Aids**

<i>Device</i>	<i>Estimated Sweep Width (NM)</i>	<i>SRU Type</i>
Strobe (2,000 candlepower peak)	0.5	Air or surface
Cyalume personnel marker light	1.0	Air or surface
Electric flashing SOS lantern or hand flashlight <sup>a</sup>	3.0	Air or surface
Strobe lifejacket light	3.5	Air or surface
Tracer bullets	4.0	Air or surface
Red hand flare (500 candlepower)	6.0	Air or surface
Red Very signals	8.0	Air or surface
Aircraft marine markers	8.0	Air or surface
Red pen gun flare	8.0	Air or surface
Red meteor (star) or parachute flare (10,000 candlepower)	10.0 or limit of SRU visibility	Air or surface

<sup>a</sup> These estimates were derived from test data collected only on surface searches.

**423 EPIRB/ELT**

A. The following guidelines, listed in order of preference, are recommended for developing an EPIRB/ELT sweep width:

1. When minimum detection range is known:  
 $W = (1.7) \times (\text{minimum detection range})$ .
2. When average detection range is known:  
 $W = (1.5) \times (\text{average detection range})$ .
3. When maximum detection range is known:  
 $W = (1.0) \times (\text{maximum detection range})$ .
4. When no detection range is known:  
 $W = (0.5) \times (\text{horizon range})$ , using horizon range table (Figure 4-4, par 443).

B. If search aircraft VHF/UHF antennas are located on top of the aircraft or in the tail, the sweep widths determined by these rules should be reduced by 25 percent.

C. If search area is in mountainous, jungle, wooded, or other vegetation areas, reduce values for W by one-half.

**424 Radar****A. Surface Vessel****TABLE 4-15. Sweep Widths for Surface Vessel Radar<sup>a</sup> (NM)**

<i>Target Type</i>	<i>Douglas Sea State</i>	<i>Surface Vessel Radar System</i>	
		<i>AN/SPS-64(V)</i>	<i>AN/SPS-66</i>
Small (20 feet or less) fiberglass boats, without radar reflector or engine/metal equipment	0 to 1	1.4	0.8
	2 to 3	1.1	0
Small (20 feet or less) fiberglass boats, with radar reflector or engine/metal equipment	0 to 1	5.0	2.0
	2 to 3	1.6	0.4
Medium to large vessels (40 feet or over) with significant amounts of reflective material	0 to 2	13	9.5

<sup>a</sup> For intermediate size targets in sea states below 3, the information from the SVR table should be interpolated. For sea states greater than 3, sweep width should be estimated on the basis of sea state and target characteristics.

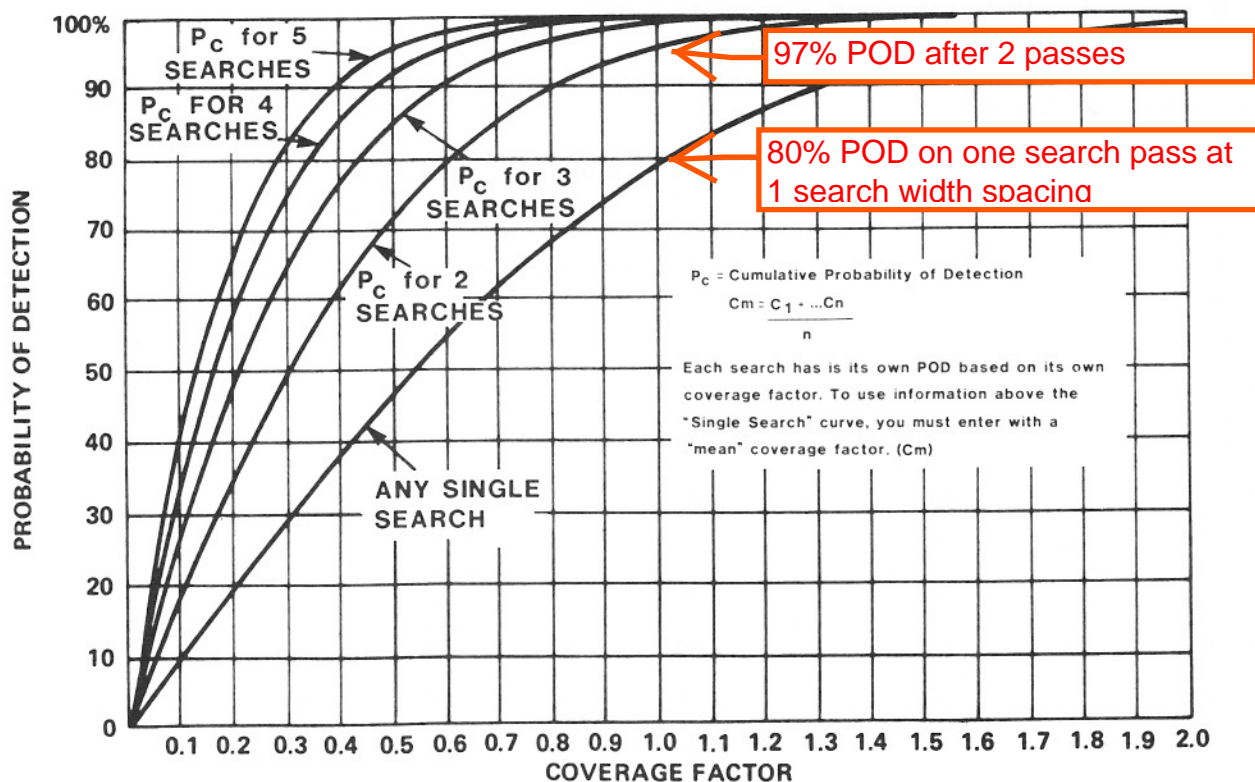


Figure 4-3. Maritime Probability of Detection

TABLE 4-25. Inland Probability of Detection: Single Search

OPEN, FLAT TERRAIN					MODERATE TREE COVER (or HILLY)					HEAVY TREE COVER (or VERY HILLY)				
Search Alt.	Search Visibility				Search Alt.	Search Visibility				Search Alt.	Search Visibility			
Track Spacing	1 mi	2 mi	3 mi	4 mi	Track Spacing	1 mi	2 mi	3 mi	4 mi	Track Spacing	1 mi	2 mi	3 mi	4 mi
500 ft					500 ft					500 ft				
.5 mi	35%	60%	75%	75%	.5 mi	20%	35%	50%	50%	.5 mi	10%	20%	30%	30%
1.0 mi	20	35	50	50	1.0 mi	10	20	30	30	1.0 mi	5	10	15	15
1.5 mi	15	25	35	40	1.5 mi	5	15	20	20	1.5 mi	5	5	10	10
2.0 mi	10	20	30	30	2.0 mi	5	10	15	15	2.0 mi	5	5	10	10
700 ft					700 ft					700 ft				
.5 mi	40%	60%	75%	80%	.5 mi	20%	35%	50%	55%	.5 mi	10%	20%	30%	35%
1.0 mi	20	35	50	55	1.0 mi	10	20	30	35	1.0 mi	5	10	15	20
1.5 mi	15	25	40	40	1.5 mi	10	15	20	25	1.5 mi	5	5	10	15
2.0 mi	10	20	30	35	2.0 mi	0	10	15	20	2.0 mi	5	5	10	10
1000 ft					1000 ft					1000 ft				
.5 mi	40%	65%	80%	85%	.5 mi	25%	40%	55%	60%	.5 mi	15%	20%	30%	35%
1.0 mi	25	40	55	60	1.0 mi	15	20	30	35	1.0 mi	5	10	15	20
1.5 mi	15	30	40	45	1.5 mi	10	15	20	25	1.5 mi	5	10	10	15
2.0 mi	15	20	30	35	2.0 mi	5	10	15	20	2.0 mi	5	5	10	10