NATSAR Manual Amendment Schedule – To be agreed at NATSAR 45

Date received	Amendment Number	Current manual reference	Reason for amendment	Previous Wording	New Wording *For images or tables that cannot fit within this document are to be attached to email to Secretariat.	Name/agency	Comments
18/09/20	1	Search By RADAR Page 257 4.7.38	Further detail on RADAR search planning	As per attachment 1. Suggested removals have been struck through.	As per attachment 1. New suggestions have been highlighted in yellow.	Glenn Chapman Manager SAR Observer Operations Cobham Special Mission	Submitted to NATSAR 44 but requires further consultation with JRCC and Cobham Approved by JRCC – see email from Glenn Columbine 25 May 2021
15/10/2020	2	Vol 1 – 1.9.8	Please refer page 4 amsa372-gmdss-handbook-2018 Functional requirements for GMDSS compliant ships	1.9.8 Additionally the GMDSS provides for urgency and safety communications, and the dissemination of Maritime Safety Information (MSI). Certain fishing vessels and other marine craft may also carry GMDSS equipment. RCC personnel may seek advice from JRCC Australia staff who are familiar with the SOLAS GMDSS provisions and associated IMO documents. GMDSS equipped vessels can be expected to perform the following functions wherever they operate: a) Transmit ship-to-shore distress alerts by two independent means; b) Receive shore-to-ship alerts (usually relayed by International RCCs); c) Transmit and receive; d) Ship-to-shore alerts; e) SAR coordinating communications; f) On-scene communications; g) Locating signals; h) Maritime safety information; i) General radio communications to and from shore; and j) Bridge to bridge communications.	1.9.8 Additionally the GMDSS provides for urgency and safety communications, and the dissemination of Maritime Safety Information (MSI). Certain fishing vessels and other marine craft may also carry GMDSS equipment. RCC personnel may seek advice from JRCC Australia staff who are familiar with the SOLAS GMDSS provisions and associated IMO documents. GMDSS equipped vessels can be expected to perform the following functions wherever they operate: a) Transmit ship-to-shore distress alerts by two independent means; b) Receive shore-to-ship alerts (usually relayed by International RCCs); c) Transmit and receive ship-to-ship distress alerts; d) SAR coordinating communications; e) On-scene communications; f) Locating signals; g) Maritime safety information; h) General radio communications to and from shore; and i) Bridge to bridge communications.	River Chung (Public reader)	Received through NATSAR inbox
29/11/20	3	Preliminaries - Glossary	Update to reflect new technology		**(1)** Enhanced Group Call (EGC) system – the international broadcast of coordinated Maritime Safety Information and Search and Rescue related information, to a defined geographical area using a recognized mobile satellite service. **(2)** International Iridium SafetyCast service – the coordinated broadcast and automatic reception of Maritime Safety Information and Search and Rescue related information via the Enhanced Group Call system, using the English language. **(3)** Maritime Safety Information (MSI) – navigational and meteorological warnings, meteorological forecasts and other urgent safety-related messages broadcast to ships. **(4)** NAVAREA – a geographical sea area established for the purpose of coordinating the broadcast of navigational warnings. The term NAVAREA followed by a roman numeral may be used to identify a particular geographical sea area.	Hemi Manaena, JRCC Australia	Resulted from review noting the introduction of Iridium services. Stu Shepard has reviewed as SME and supported.

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					(5) Recognized mobile satellite service – any service which operates through a satellite system and is recognised by IMO for use in the GMDSS.		
29/11/20	4	Preliminaries – Acronyms and Abbreviations	Update to reflect new technology		EGC – Enhanced Group Call	Hemi Manaena, JRCC Australia	
29/11/20	5	Volume 1 – 2.4.2 – Maritime Safety Information	Update to reflect new technology	Maritime Safety Information (MSI), such as warnings of hazards to navigation, is promulgated by JRCC/FSH Australia and broadcast through the Inmarsat SafetyNET and some Limited Coast Radio Stations (LCRS). Broadcast of MSI serves to assist with preventing SAR incidents from occurring. This service is provided by JRCC Australia throughout Australia's region and NAVAREA 'X' (Ten).	Maritime Safety Information (MSI) is coordinated, collated and issued by JRCC Australia as the NAVAREA X Coordinator and National Coordinator for Australia. JRCC Australia broadcasts MSI by satellite using the Enhanced Group Call system and by HF radio, while some Limited Coast Radio Stations (LCRS) will broadcast by MF/VHF radio. Broadcast of MSI serves to assist with preventing SAR incidents from occurring.	Hemi Manaena, JRCC Australia	
29/11/20	6	Volume 1 – 2.4.4 – Unlawful Acts	Update to reflect new technology	Special signals have been developed for use by ships under attack or threat of attack from pirates or armed robbers. "Piracy/Armed Robbery Attack" is a category of distress message for all classes of digital selective call equipment and Inmarsat has added a piracy message to the Inmarsat C menu for the Global Maritime Distress and Safety System (GMDSS). For their own safety, ships may have to covertly send out the "Piracy/Armed Robbery Attack" message.	Special signals have been developed for use by ships under attack or threat of attack from pirates or armed robbers. "Piracy/Armed Robbery Attack" is a category of distress message for all classes of digital selective call equipment and GMDSS-compliant communications terminals manufactured by recognized mobile satellite service providers. For their own safety, ships may have to covertly send out the "Piracy/Armed Robbery Attack" message.	Hemi Manaena, JRCC Australia	
29/11/20	7	Volume 2 – 1.3.3	Update to reflect new technology	Ships operating under GMDSS requirements in the Australian SRR can be expected to carry: a) MF DSC; b) VHF radiotelephone (Channels 6, 13, 16 and 67); c) VHF DSC (Channel 70); d) Inmarsat-C or HF DSC; e) An AIS-SART or RADAR SART; and f) An EPIRB.	Ships operating under GMDSS requirements in the Australian SRR can be expected to carry: a) MF DSC; b) VHF radiotelephone (Channels 6, 13, 16 and 67); c) VHF DSC (Channel 70); d) HF DSC or a ship earth station of a recognised mobile satellite service; e) An AIS-SART or RADAR SART; and f) An EPIRB	Hemi Manaena, JRCC Australia	
29/11/20	8	Volume 2 – 2.5.4	Update to reflect new technology	2.5.4 Distress alerts may be received by the RCC from various sources. The following are typical examples: a) Aural reception of a distress beacon by an aircraft. b) Detection by the COSPAS-SARSAT satellite system. c) Receipt through Airservices Australia. d) Receipt by the Inmarsat system, aeronautical or maritime. e) Receipt through a coast radio station. f) Receipt through other alerting systems, e.g. ARGOS, SPOT. g) Direct communications from the public or the distressed craft. h) Another RCC or SAR authority.	2.5.4 Distress alerts may be received by the RCC from various sources. The following are typical examples: a) Aural reception of a distress beacon by an aircraft. b) Detection by the COSPAS-SARSAT satellite system. c) Receipt through Airservices Australia. d) Receipt through a recognized mobile satellite service provider. e) Receipt through a coast radio station. f) Receipt through other alerting systems, e.g. ARGOS, SPOT. g) Direct communications from the public or the distressed craft. h) Another RCC or SAR authority.	Hemi Manaena, JRCC Australia	

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11/03/2021	9	Appendices – Appendix B – National SAR Responsibilities	Clear up Oil and Gas SAR responsibilities from Annual Meeting 37	Nil	See attachment 2 and working paper 33 8-1-3 Oil & Gas Facilities – new text highlighted in yellow.	Secretariat	
03/05/2021	10	Vol 2, SAR Operations, page 249, para 4.5.43	Noticed in the latest NATSAR manual on page 249, that section 4.5.43 refers to the "Sector Search Calculations" Table 4-4 as being located in Appendix D-7, Worksheet 5, Table 4-4. But there is no longer a table in that particular location. Rather, the table is located in section 4.5.47 - one page after the above reference on page 250.	4.5.43: Each search leg is separated by an angle based on the maximum track spacing at the end of the legs and the search radius. For convenience, the angular displacement between each search leg and the distance required to fly the pattern for various track spacing and search radii may be extracted from Appendix D-7, Worksheet 5, Table 4-4, Sector Search Calculations.	4.5.43: Each search leg is separated by an angle based on the maximum track spacing at the end of the legs and the search radius. For convenience, the angular displacement between each search leg and the distance required to fly the pattern for various track spacing and search radii may be extracted from Table 4-4, Sector Search Calculations, on the following page. The table has also been modified for ease in reading (Attachment 3)	Dylan Lane – Cobham Changes by Jim Whitehead QPol.	
09/07/2021	11	Vol 2. 3.6.1	Error in the depth of water. Should be 300 feet or ~100 metres, NOT 300 metres.	3.6.1 A great number of maritime search and rescue incidents occur within 25 NM of the coast, in under 300 metres of water. The coastal search-planning model is to assist with a rapid response and should ideally be used when the report of a target in distress is notified to a SAR authority within six (6) hours of the actual distress situation arising.	3.6.1 A great number of maritime search and rescue incidents occur within 25 NM of the coast, in under 100 metres of water. The coastal search-planning model is to assist with a rapid response and should ideally be used when the report of a target in distress is notified to a SAR authority within six (6) hours of the actual distress situation arising.	John Rice SAR Training Australia	
09/07/2021	12	Figure 3-26 Total Search Area – Explanatory text.	Not every target will be able to anchor, e.g., a person in the water, or a small craft depending on the depth. Therefore, it will be a waste of valuable time to have to search an area where the target cannot be located due to drift.	The area between LKP/SP and datum should be included in the search area. This covers the target being able to anchor or cling to an object.	The SMC should consider searching the area between the LKP/SP and the Datum Point (D_1) if the possibility exists that the target could anchor or if there are any fixed structures such as off-shore platforms, buoys or beacons from which a vessel could be attached or a person in the water could gain support.	John Rice SAR Training Australia	
09/08/2021	13	494	Updated distance table for LPB Despondent. Minor wording changes.	New page sent to Secretariat.	See attachment 4	Jim Whitehead QPol	
09/08/2021	14	498	Updated distance table for LPB Despondent - Alzheimer's/Dementia. Minor wording changes.	New page sent to Secretariat.	See attachment 5	Jim Whitehead QPol	

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09/08/2021	15	520	Changes to wording and new information on bones.	New appendix sent to Secretariat. – Attachment	See attachment 6	Jim Whitehead QPol	
09/08/2021	16	414	New Figure D-5:3 Person Powered Craft to include sail board	New page sent to Secretariat.	See attachment 7	Jim Whitehead QPol	
09/08/2021	17	416	New multi-hulled vessels	New page sent to Secretariat	See attachment 8	Jim Whitehead QPol	
09/08/2021	18	354	Correction to example	7.16.11: Example: A person is missing in the alpine area of NSW. The wind is 40kph from the south. Air temperature is 0°C degrees and they are wearing nothing but underclothes. Using the wind chill table (Table 7-2) we can ascertain that the equivalent air temperature is going to be very cold, about -12°C.	7.16.11: Example: A person is missing in the alpine area of NSW. The wind is 40kph from the south. Air temperature is 0°C degrees and they are wearing nothing but underclothes. Using the wind chill table (Table 7-3) we can ascertain that the equivalent air temperature is going to be very cold, about -7°C.	Jim Whitehead QPol	
16/08/2021	19		Just noticed a couple of minor editorial things need tidying up in the National SAR Manual.	1.2.50 has "xxx" in its text. I'm not sure what was intended to be written there. Also the following 1.2.51 and 1.2.52 should be renumbered as one level down and tabbed inwards as they are options to 1.2.50, and the reference to faxing should be replaced with email. My suggested amendments are as follows:	1.2.50 In ~~xxx~~ circumstances where assistance is required to task a marine or aviation SAR asset, the coordinating SAR Authority can request JRCC Australia to prepare a briefing for ~~a marine or aviation SAR~~ those assets. JRCC Australia will: ~~1.2.51~~ a) Prepare and provide the briefing and ~~fax~~ email it to the coordinating SAR Authority for the crew; or ~~1.2.52~~ b) Prepare and provide the briefing and ~~fax~~ email it directly to the crew, copied to the coordinating SAR Authority. Then from 1.2.53 to 1.2.61 will need renumbering.	Scott Constable - AMSA	
23/08/2021	20	New manual second page	New manual second page		See attachment 9	Jim Whitehead - QLDPOL	

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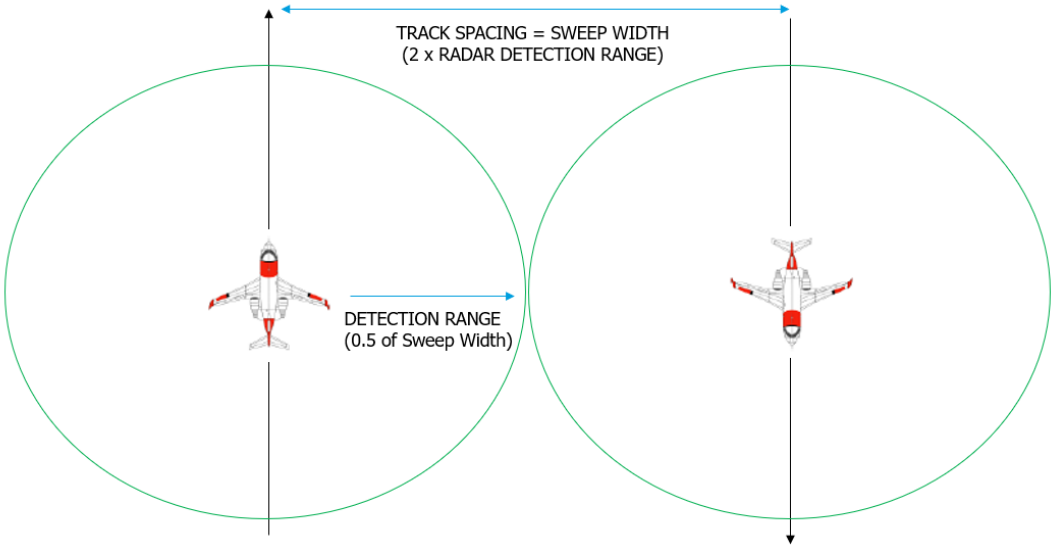
Attachment 1:

Search by RADAR

4.7.38 RADAR may be primarily used for maritime searches. Most available airborne RADAR would be unlikely to detect typical search objects on land except for metal wreckage in open areas such as desert.

4.7.39 The sweep width and track spacing to employ will depend on the type of RADAR, height, environmental clutter and noise, RADAR cross-section of the target, RADAR beam refraction due to atmospherics and operator ability. W and S should be agreed between SMC and operator.

4.7.40 During search planning, the aircraft sensor operator should provide a theoretical target detection range based on target type and prevailing meteorological conditions to the SMC. Detection range is a radius figure as the aircraft is at the centre of the RADAR search annulus, therefore the theoretical detection range figure should be doubled in order to determine an agreed W.



4.7.41 It should be noted that when the wave height increases to above one to two metres, the probability of detecting a small object ~~rapidly~~ decreases for most RADAR and consequently so ~~does~~ should the sweep width. ~~The probability of detection of a small target rapidly decreases~~.

4.7.42 RADAR minimum range is determined by the RADAR pulse width and aircraft search height. W of less than 2 NM should not be considered as this is likely correspondent with the minimum range of most modern search RADAR.

4.7.43 ~~The altitude used should normally be between 2,500 and 4,000 ft. for small search objects and a maximum of 8,000 ft. for large search objects.~~ Table XX provides the theoretical RADAR horizon correspondent with aircraft search height. Search heights between 500 to 1500 ft for small targets allow for visual search to be conducted concurrently with RADAR. This is a delicate balance as operations at lower altitude will also increase the

occurrence of RADAR 'clutter' which may present as false targets which will reduce the efficiency of the search and speed of advance through the search area.

Aircraft Height in Feet	RADAR Horizon
500	27 NM
1000	39 NM
1500	48 NM
2000	55 NM
2500	62 NM
3000	67 NM
4000	78 NM
5000	87 NM

Table XX

4.7.44 The presence of atmospheric inversion layers should also be considered during the execution of a RADAR search. Aircraft operating below an inversion layer may experience greater than anticipated detection ranges due to a ducting effect. Conversely, operations above an inversion layer will reduce probability of detection.

Attachment 2:

Suggest inclusion of the following column into the National SAR Responsibilities as per working paper 33 8-1-3 Oil & Gas Facilities

DIVISION OF RESPONSIBILITY		FUNCTION TO BE PERFORMED BY, OR ON BEHALF OF, THE OVERALL COORDINATING AUTHORITY					
For land, sea and air SAR, in respect of:	**Responsible Authority[1]**	**Provision and coordination of air SAR Assets.**	**Provision and coordination of land SAR Assets.**	**Provision and coordination of maritime SAR Assets.**	**Communication (other than air/surface)**	**Air/ground communication for land search and rescue.**	**Aircraft/ship communication where direct communications not available.**
IN RESPECT TO PERSONS ON OIL AND GAS FACILITIES AT SEA ASSOCIATED WITH THE EXPLORATION, PRODUCTION, STORAGE AND OFFLOADING OF PRODUCT.	JRCC Australia Police*[1]	JRCC Australia Police	Police	Police JRCC Australia Police	JRCC Australia Police	Airservices Australia Police	Airservices Australia Police

NB: This responsibility matrix relates only to search and rescue responsibilities and does not replace the responsibilities of other organisations as they relate to safety, security and environmental issues on Oil and Gas facilities.

*Responsibility for the rescue of persons from oil and gas facilities at sea will be determined in accordance with the 'Best Placed' provisions.

Will require that NOPSEMA is informed of this change.

[1] The first SAR Authority to become aware of a SAR incident is obliged to respond until overall coordination can be transferred to the 'Best Placed' SAR Authority in accordance with the provisions of the Inter-Governmental Agreement on National Search and Rescue Arrangements 2017 and the principles set out in the National SAR Manual

Attachment 3:

SECTOR SEARCH CALCULATIONS (This table must not be interpolated)								
S (MTS)	**1**		**2**		**3**		**4**	
R (Radius)	**Deg.**	**D**	**Deg.**	**D**	**Deg.**	**D**	**Deg.**	**D**
5	24	90	48	45	72	30	100	30
10	12	330	24	180	36	120	48	90
15	8	720	16	375	24	270	32	210

Table 4-4 Sector Search Calculations

Attachment 4:

Lost Person Behaviour Despondent
Characteristics: a. Don't often travel far, but intend to be alone b. Often located on a border of two types of terrain and/or vegetation boundary c. May head for a scenic location or well-known beauty spot. d. Locations are often well known to MP, check with family e. Rarely located in dense underbrush or trees. f. Rarely respond to call and whistles and may hide. g. Very high fatality rate h. Drugs and/or alcohol often involved.
Tendencies: a. Go to high points or scenic locations. b. Well known or favourite places. c. Terrain interfaces d. Group 1- merely seeking to get out of sight. e. Group 2-will seek out a specific location, significant to their life. f. Some in this category may travel further.
Strategies: a. Investigation into circumstances is important b. Obtain a good subject profile from family, friends, GP (May be on depression meds) and social media. c. Urgent response d. Thorough search of a small area e. Confinement is a low priority f. Passive techniques not successful
Where located statistically: a. Habitation 28% b. Water/water's edge 24% c. Forest/woods 18% d. No trace 12% e. Road 9% f. Forest edge/clearing 9%

% of category	25	50	75	80	95
Distance from LKP (KM)	0.41	1.05	2.29	2.46	18.14

Attachment 5:

Lost Person Behaviour Alzheimer's/Dementia

Characteristics:

a. Poor short term memory but may remember things that happened many years ago, such as address while a child.
b. Impaired ability to rationalise surroundings.
c. Often last seen in their home or a nursing home.
d. May have a previous history of wandering
e. Other physical problems may exist (Limited mobility, poor sight or hearing)
f. May be seeking a secluded location
g. Will not attract attention or respond to calls (Often no concept of being lost).
h. Possible no concept of being lost
i. Will not often leave any clues apart from paradoxical undressing.
j. Often succumbs to the environment (Hypothermia etc)
k. 18% fatality rate if not located within first 24hrs
l. Two types, walkers (Younger/fitter) and non-walkers (Elderly/medical issues)

Tendencies:

a. Often located a short distance from a road or path.
b. Will often attempt to travel to a place previously known to them (Even if this is an impossibility).
c. Will be stopped by fences, hedges etc (Limited peripheral vision).
d. Will tend to walk on the path of least resistance, downhill, and not often uphill. (**Be aware**: more physically capable, MP's may walk uphill or in a direct line regardless of terrain).
e. Can be found in drains or streams due to the low levels.
f. May remove items of clothing

Strategies:

a. High urgency
b. Early containment is essential
c. Use dogs or trackers
d. Check all drains and low lying areas.
e. Check all fences, hedges and private yards in vicinity
f. Thorough search of the house, nursing home, and repeat every few hours.
g. Search heavy bush
h. Search previous home locations.

Where located statistically:

a. Habitation/ structure 35%
b. Road 35%
c. Water 10%
d. Open ground 9%
e. No trace 5%
f. Forest 4%

% of category	25	50	75	80	95
Elderly/non-walker Distance from LKP (KM)	0.19	0.51	1.4	1.5	3.9
Younger/walker Distance from LKP (KM)	0.49	1.28	2.65	3.2	14

Attachment 6:

Appendix E-15 Search for Skeletal Remains

The search for human remains from crime involves a number of techniques depending on the stage of decomposition of the target. Searches may be for the following target types:

a) Grave sites, deep or shallow: Searchers are looking for disturbances in the landscape, vegetation changes, dips or hollows, ground discolouration and cracking. It is near impossible to dig a grave and return the scene to its original condition. An aerial search may uncover potential sites of ground and/or vegetation disturbance. Historically, once a victim is buried they are generally undisturbed until located by a search team, although there is evidence that shallow graves have been disturbed by wild and/or domestic animals.

b) Disposal locations: Bodies may be quickly disposed of by criminals using what is readily available. (Covered with sticks and branches, leaf litter, rolled in carpet or other items, pushed into hollow items such as pipes and logs). There may be signs of darkened earth or dead vegetation caused by volatile fatty acids leeching from the body.

c) Initial crime scene locations: The initial crime scene will provide forensic evidence and may be identified by signs of a struggle, broken branches, trampled grasses, ground disturbance, clothing, blood stains and/or other visible signs of a crime. This may not necessarily be the location of the victim.

d) Skeletal remains and bone dispersion: Searches conducted after lengthy periods of disappearance may be looking for skeletal remains. The search for skeletal remains is dependent on a number of factors:

   i) Length of time since initial incident: Skeletisation periods can vary from 2-3 years for persons buried in deep graves, 6-12 months for those in shallow graves and much shorter periods for those left on the surface or loosely covered. Cold weather will also slow the process of decomposition down but warm, moist weather can have the opposite effect. Wildlife distribution in the area, insects, dogs, pigs, cats, birds and other carnivores will contribute to decomposition.

   ii) Method of disposal: Burial inhibits decomposition due to a number of factors, including limited oxygen, limited exposure to flies and animals and generally cooler temperatures.

   iii) Animal predation in area: Animals will hasten the decomposition of flesh, leaving only the skeletal remains. Evidence shows that bone dispersion often results from animal activity. There are some generalisations for bone dispersal:

   - During the initial stages of decomposition the tendons and ligaments tend to hold a body together. This limits animal activity to removing flesh and softer body parts.
   - The body disarticulates from the outside in, with the limbs being the first to separate, allowing them to be moved by predatory animals. The skull will also separate from the vertebra and the neck vertebra from each other.
   - The limbs may be taken as a whole by predators, to be further disarticulated at other locations.
   - The skull is one of the last items to be moved due to its size and the difficulty in grasping it with teeth.
   - Bone dispersal is generally in an oval shape, with the body core being at the higher elevation focus of the oval. The limbs and other bones are mostly located in a downhill direction.

- The oval shape is dependent on the terrain, with animals skirting rocky outcrops, thicker vegetation and waterways. The bone dispersion will generally follow animal tracks.
- As limbs disarticulate the dispersal pattern will go from the larger bones, femur and humerus, to the medium bones of tibia, fibula, radius and ulna to the individual hand and foot bones. The smaller bones are often difficult to recognise as bones so it is recommended that a forensic osteologist be available on scene to assist with identification.
- The main section of the body will eventually collapse on itself with some of the smaller bones, such as ribs, being moved by animals.
- The length of the dispersal oval can be between 10 and 135m depending on the local animal population. It is recommended that the latter be considered during the initial stages of the search.
- Bones can be discoloured by the environment and are often not the bleached white colour expected by searchers. They can take on the hues of the local environment due to the leeching effect of rain and the natural tannins found in plant life. The search briefing should be very clear on this point (Bone details are contained at end of this appendix).
- The age of the victim will also impact on what bones remain to be found. The bones of children and teenagers will not have fully ossified or calcified leaving only misshapen slivers or portions of bone to be discovered.
- Any objects suspected of being a bone should be examined *insitu*, as the location of each bone can provide an indication of what position the victim was originally placed.

Figure E-15:1: Bone scattering

Two search methods are recommended for skeletal searching:

a) Single direction contact search. All search members are lined up shoulder to shoulder and proceed at a set pace through the search area. They should be armed with a hooked pole to move vegetation and other ground debris. Each member is responsible for their own search path. The usual rules on locating an object will apply. When a bone is located the searchers will commence a hands and knees search of the area at least 10m around the located bone.

b) Search teams start at opposite ends of the search area, shoulder to shoulder and walk towards each other. The teams pass and continue on to the end of the search area. While this is more labour intensive it does allow the area to be search twice, from different directions at once, increasing to probability of detection to beyond what would be possible from two separate searches.

The pre-search briefing must be comprehensive with respect to potential search objects, bone shape, colour and size, to ensure a thorough search is undertaken. Good investigative information is

necessary to reduce the potential search area to a minimum as these types of searches are labour intensive, physically tiring and mentally straining.

Bone characteristics.

Exposure on ground surface causes a number of effects:

a) Bone collagen protein content is degraded by UV light and water (rain) exposure
b) Bone mineral content is degraded by water exposure
c) Overall, the loss of collagen is greater than the loss of bone mineral.
d) The key phenomenon with ground surface exposure is transpiration.
   - Bone acts as a wick, drawing moisture from the soil and evaporating that moisture from the uppermost surface of the bone.
   - The result is the deposition of minerals from the soil pore water inside the bone cavities and the formation of surface crusts of evaporate minerals on the uppermost surface of the bone.
e) Bones can be heavily degraded in as little as 2-15 years.

Surface exposed bones are typically white or light grey in colour, their surface is cracked or has a "wood-grain" appearance and is rough to the touch like sandpaper. Surface exposed bones often get snagged on clothing due to their rough texture.

Bone exposed on ground surface showing mineral crust formed on the uppermost surface of the bone due to transpiration

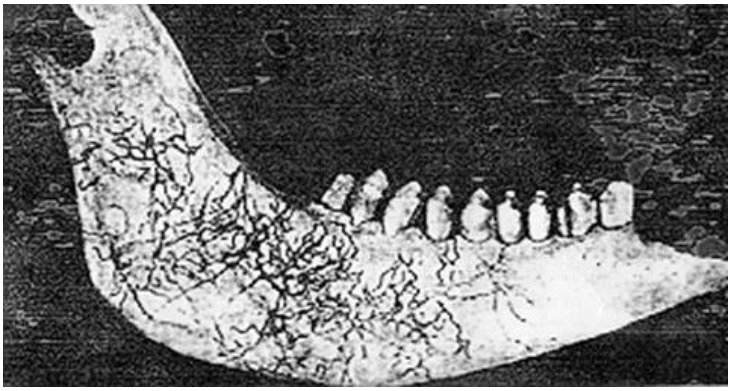
Bone exposed on ground surface showing brittle cracking due to loss of collagen

A series of 6 pictures of animal bones exposed on ground surface demonstrating cracking of the

bone cortex and “wood grain” appearance

Plant growth on bones

Plant root growth on bones causes shallow, etched depressions.



Plant roots may also obscure the shape of bones, making them difficult to detect. Buried up to 20 yrs.

Botanical evidence used in a Spanish case to demonstrate time since death.

Experiments had demonstrated that skeletonisation in Spain takes 3 yrs. Plant growth on bones would occur after skeletonisation.

a) Plant growth consistent with person missing for 6 yrs. Rib case encased in shrub root growth consistent with >3 yrs growth.
b) Plant growth consistent with person missing for 6 yrs. Bryophyte growth on exposed tibia. Bryophytes only grow on bone when organic matter is absent (i.e. after skeletonisation). Skeletonisation takes up to 3 yrs in Spain. Bryophyte annual segments on its stems indicates 3 yrs of growth.

Fungal growth on bones

Fungal attack indicates that the bone has been in an oxygenated environment. Fungi are stunted or do not grow in low oxygen/sealed environments.

Irregular white or dark grey patches of fungal growth on surface of human hip bone.

Predator damage to bones

Bone that has passed thought a carnivore's digestive system. The bone cortex can be eroded to reveal the spongy bone underneath. There may be hair sticking to the bones from the rest of the carnivore's meal.

Attachment 7:

Figure D-5:3 Person-Powered Craft

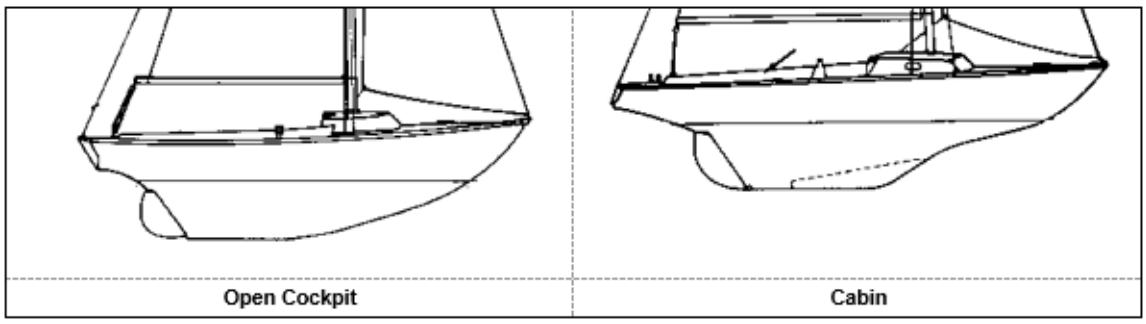


Figure D-5:4 Full Keel One Design Sailboat

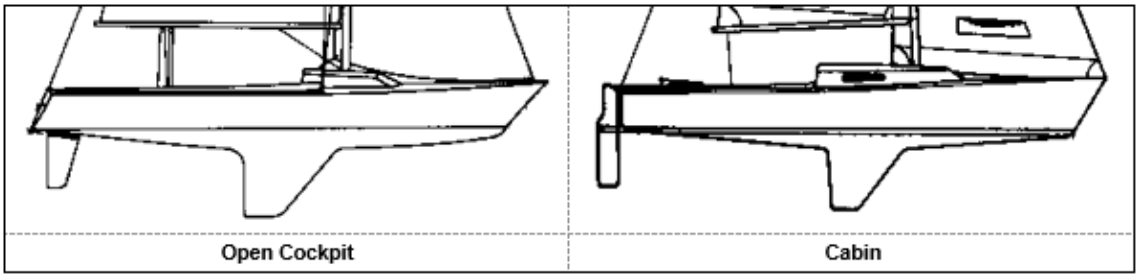


Figure D-5:51 Dagger Keel One-Design Sailboat

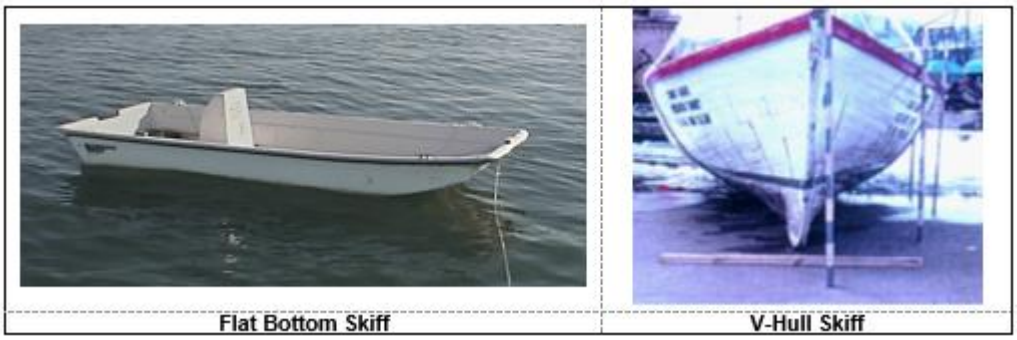


Figure D-5:6 Skiffs

Attachment 8:

Figure D-5:10 Multi-hulled vessels

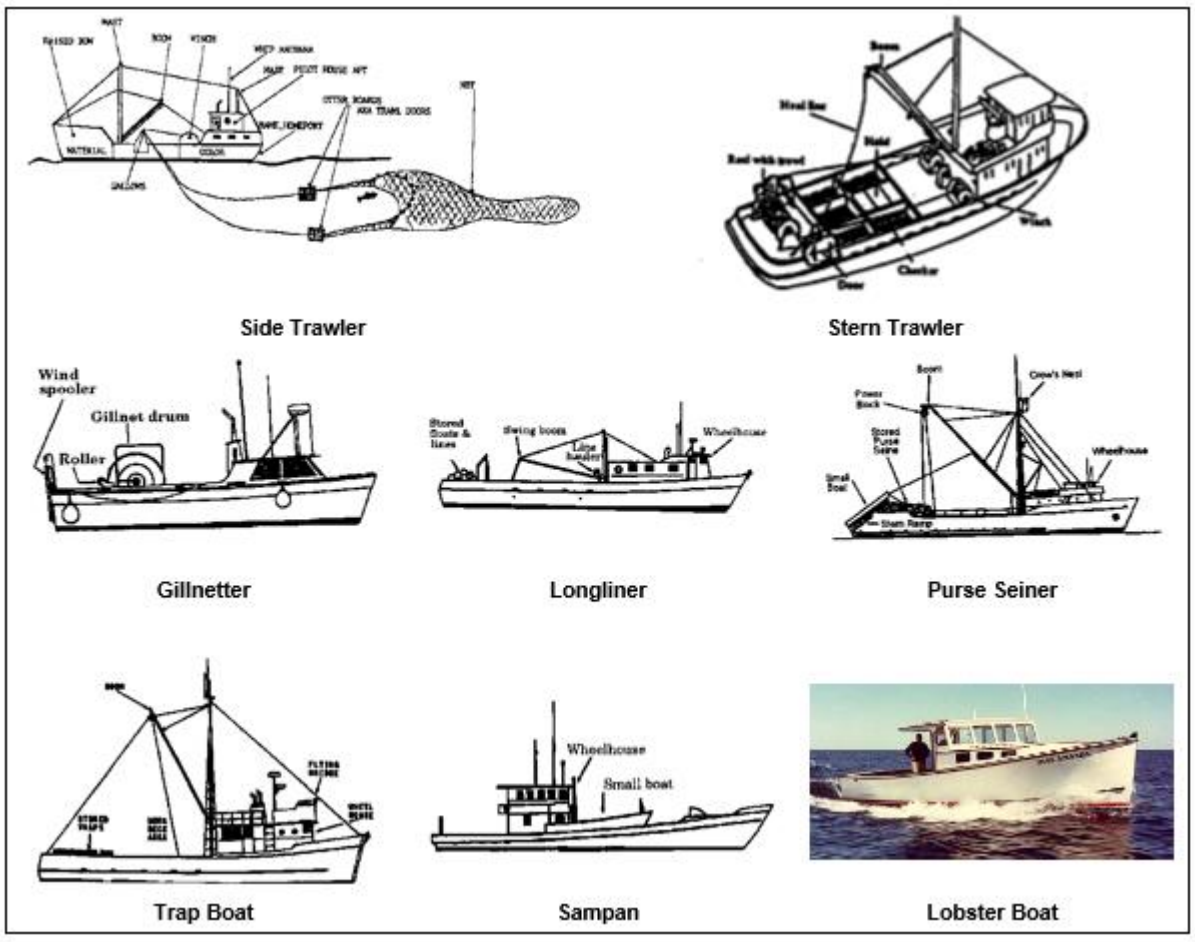


Figure D-5:10 Commercial Fishers

Attachment 9:

Australian Maritime Safety Authority

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