The RAF currently operates the Sea King HAR (Helicopter Air Rescue,) Mark 3 and 3a, the 3a having an upgraded avionics suite. The RAF Sea Kings of 202 Sqn and 22 Sqn, with additional support from the Sea Kings of the Royal Navy and the HM Coastguard S-61Ns, provide full SAR cover for land and sea rescues within the UK area of responsibility. Specifications for the RAF Sea King and S-61N are given at Annex A. This chapter contains basic procedures for operating with helicopters and important safety precautions that all MRS personnel must know. Operating helicopters in mountains and confined areas is hazardous and leaves little margin for error. However, the helicopter is extremely flexible and when used in co-ordination with ground teams, most SAR tasks, though not all, can be completed with great savings of time and effort on all sides. By observing the safety precautions and procedures outlined in this chapter, risks will be reduced to a minimum.

Types of Operation

The ways in which helicopters can be used are many and varied. There are certain limitations however and these are outlined later. Most operations can be placed into 4 categories.

1. Casualty Evacuation. In many cases the helicopter can reach the scene of the incident, land nearby, pick up the injured and take them to medical aid in the shortest possible time.

2. Winching Operations. This type of operation is particularly useful in the mountains. When it is not possible for the helicopter to land, the winchman is lowered by winch with a strop and or stretcher to pick up the casualty. Any stretcher of the Neil-Robertson, Stokes Litter, Bell or Maclnnes type is suitable for winching. If the winchman is lowered to an exposed or slippery or icy position, look after him, he is probably not a mountaineer and will almost certainly be loaded down with equipment.

3. Searches. The helicopter is capable of searching comparatively large areas of difficult terrain in a relatively short time. It has limitations when searching over forested areas and is best used to search specific features at night such as climbing routes, paths, streams or gulleys or open areas in the urban environment.

4. Deployment of MRTs. If the weather precludes the use of helicopters in the search areas, they can be used to ferry MRTs, dogs and any equipment required as close to the area as possible, so saving time and effort.

When the helicopter moves in to winch or land two things must be remembered:

1. The down-draughting from the Sea King can be quite severe, so protect the casualty and secure all loose equipment. Also ensure that rescue personnel and their equipment are secure. A loose polythene survival bag sucked into the engine intake could lead to damage, or worse still, cause the helicopter to crash.

2. Clear all non-essential personnel well away from the winching / landing site and restrict all movements to a minimum.
Emplaning and Deplaning

Safety Precautions

The following rules apply to entering, flying in and leaving the helicopter (see Figs 56 to 59):

a. Never approach a helicopter during start up or shut down.

b. Only approach or leave the helicopter when cleared to do so by a member of the crew giving a “thumbs up” signal.

c. Approach and leave only in the direction indicated by the crew. This will be in the safe sector which in the Sea King is between 10 o’clock and 12 o’clock for the front cabin door and between 1 o’clock and 3 o’clock for the main sliding door.

d. Never approach or leave near the tail, or out of sight of the crew.

e. Ensure there is no loose gear - tuck scarves and maps away. Keep your hill bag in your hands and make sure no damage is caused to the aircraft by ice axes and crampons.

f. Once in the helicopter, strap into your assigned seat and do not move until told to do so by the crew.

g. Be aware of the many danger zones on and around a helicopter.

h. When working on sloping ground, the rotor blades can come very close to the ground on the upslope side. In these circumstances it is vital when being picked up to adopt a kneeling position and stay still until signalled to approach by the crew. If in doubt about what to do, stay put and the crew will escort you. Equally, after leaving the helicopter on sloping ground, stay put in the kneeling position by the door and let the aircraft move away from you rather than you from it.

Fig 56: On Sloping Ground Stay Clear
For reasons of speed and fuel economy the pilot may prefer to land to drop off or pick up team members. However, due to the terrain or lack of suitable landing sites he may decide to use the helicopter winch for this purpose. Either a single or a double rescue strop may be used for winching. When winching down the following points should be noted:

a. Obey the winchman’s signals or instructions at all times.

b. First the winchman will help you into the strop, making sure you are secure. Make sure you have all your equipment with you - rucksack, ice axe, crampons etc. When signalled to do so, remove your seat strap and move towards the door of the helicopter. A protective floor cover within RAF Sea Kings, called a crampon mat, allows MRT members to put their crampons on before deploying. Rucksacks can either be attached to a karabiner and sling placed over the head diagonally across the body or placed on the “grabbit” hook which in turn is attached to the main winch hook. When using the “grabbit” method it is advisable to guard the gate with your hand to prevent “rollover” and losing your kit.

c. The winch operator will now winch in the cable and by doing so, draw you out of the aircraft and into a position hanging just outside the door.

d. The winch operator will then lower you to the ground. During lowering the arms should be kept by the sides, avoid the temptation to grasp the cable, as doing this could result in you falling out of the strop. Initially you may experience a slight jerk and an increase in the rate of descent. Don’t worry, this is quite normal.

e. Once on the ground, make sure you have a secure footing before removing the strop but DO NOT anchor yourself to anything while still attached to the aircraft. Remove the strop, remembering to take all your equipment. At this point you may, if you wish, give a “thumbs up” indication to the winch operator, who will be watching from the doorway of the helicopter. At this signal, or as soon as he sees that you are safely removed from the strop, he will winch in the cable for the next lower. Allow the strop to be winched from your hands; do not throw it away.

f. You are now free to anchor yourself if necessary, to await the arrival of the remainder of the party.

It is worth remembering that the temperature outside will probably be much lower than inside the helicopter, so dress accordingly and have your ice axe ready and crampons on if required. Winching up into the helicopter is basically a reversal of the above. Additional points to note are:

a. Allow the earthing strap on the winch cable to make contact with the ground before taking hold of the strop - this avoids any danger of static shock from the helicopter. The winch operator will attempt to winch the strop to you rather than you moving to get the strop. Wear your helmet and if possible, ear protection. Always cover your arms and legs.

b. Remove rucksack, ice axe etc and, as late as possible, any anchor you may have BEFORE attempting to get into the strop. Hang your rucksack on a sling and karabiner placed over the head and one arm, or, once you are in the strop, place your rucksack on the “grabbit”, remembering to guard the gate. Crampons may be left on until safely inside the aircraft if required, if a crampon mat is fitted.
c. Place the strop over your head and under each arm, pull the toggle firmly down and then pick up any equipment you wish to take. When ready give a thumbs up sign and then stand still - do not move around in an attempt to get to what you believe is a better winching position once you are in the strop. As you are winched in do not attempt to correct any swing nor attempt your own entry into the cabin. Allow the winch operator to do all this. You will be pulled into the cabin with your back to the aircraft. Then do as indicated by the winch operator. When a double lift is being carried out stand together not apart. If you stand apart you will crash together.

Rigging of MR Stretchers for Winching by SAR Helicopters

Most stretchers used by the RAF MRS are suitable for winching, the exception being the “Quick” stretcher. The Bell stretcher is prepared for winching using 4 “Superblue” slings, as is the split MacInnes stretcher, while the MacInnes lightweight uses integral wire slings permanently attached to the stretcher, although in some cases these may have been removed, in which case 4 Superblue slings are to be used. If for any reason the winchman is unhappy with the type or condition of the slings he will resort to using 4 “superblues”, a triangular mallion and 4 karabiners which are all carried in the helicopter.

For the majority of stretchers including the Bell, one sling is secured to each corner of the stretcher using SCREW GATE KARABINERS. The other ends are then brought together, in the centre, using a large screw gate karabiner or mallion (it may be necessary to join each end sling with one karabiner then join the 2 pairs with another, taking care to load the centre karabiner correctly). Any loose ends should be secured before the helicopter approaches.

The winchman will not proceed with the winch until he is happy with the security of the slings and the position of the stretcher. He has the ultimate responsibility and authority when winching. The casualty should be secured in the stretcher as for a vertical lower, and just prior to winching, check that the screw gates are done up. If the stretcher is of the split - apart type, double check the locking mechanism.

When the helicopter moves in to winching position, at least 2 people should stay with the stretcher to:

a. Prevent it from being blown.

b. Protect the casualty from downdraught and debris (use eye protection).

c. Assist the winchman.

d. During recovery of the stretcher, casualty and the winchman, the crew may elect to use a “hi-line”. This is 150 feet of nylon rope rigged in a pouch. At each end there is a karabiner. At one end there is a weak link, 150 lbs. joining the rope to the karabiner. This end is attached either to the hook or the stretcher. With the “hi-line” attached the winchman will then be recovered to the helicopter. During this time the MRT should allow the “hi-line” to pay out maintaining firm pressure. This will stop the winchman and stretcher from swinging and spinning. Once the winchman has reached the door he may elect to release the “hi-line” allowing it to drop away, so be aware.
Notes

1. Any stretcher handles, fitted during lowering or carrying, should be removed or placed in the stowed position before winching. See Fig 52.

2. Rigging of stretchers for winching into HM Coastguard S-61N is identical as for RAF / RN helicopters.

Fig 52: Using the integral lifting rings, and with headguard on, the assembled Bell Stretcher is neat and compact for winching into a helicopter

Operating Limitations

The main limitations for helicopter operations are listed below:

a. **Weather.** Low cloud, high winds, snow and icing are the major hazards. In general the helicopter will not be able to operate in cloud unless it is possible to hover taxi in visual contact with the ground. The helicopter can then be of help when the MRT have carried the casualty down below the cloud base. Similarly, high winds and the associated turbulence will severely limit the helicopter’s ability to make a pick up and may require the casualty to be moved further down the mountain to a more sheltered location. A wind across a mountain ridge can cause violent up and down draughts; the up-draught on the windward side of the mountain may have a greater upward velocity than the maximum rate of descent of the helicopter, or even worse, the down-draught on the lee side may be greater than the aircraft’s maximum rate of climb. In heavy snow and / or icing, operations at all heights will be very severely restricted and may not be possible at all.
b. **Aircraft Performance.** The helicopter’s payload depends to a great degree on the amount of fuel it is carrying. For the crew it is a constant trade-off between fuel, payload and most importantly having a good power margin, especially in the mountains. For operations in the mountains the crew will try and keep the fuel load low in order to give a reasonable payload and power margin. This, however, has the disadvantage of increased trips for fuel. Refuelling in the field can take a minimum of 30 minutes and this does not include transit to and from the scene so do not be surprised if the helicopter is away for up to an hour!

c. **Night Operations.** Some sort of visual references are essential for night work in the hills, and the conditions described above would render many night operations to be out of the question. RAF SAR helicopter crews all carry Night Vision Goggles (NVGs) giving an improved and enhanced night flying capability. Under ideal conditions, clear sky, full moon and being close to cultural lighting, they can “turn night into day”. HOWEVER, the majority of mountain incidents will normally mean flying in bad weather, low cloud and with no or little cultural lighting which all severely degrade the “picture”. Additionally, because NVGs are monochrome, i.e. green, there is very little depth perception or texture. NVGs are a useful tool but do have their limitations. Individual crews will make their own decisions based on their knowledge of the incident area, their own level of experience and the state of the casualty. For further details regarding NVG operations, see the NVG aide memoir at Annex B.

Note:

At present the Coastguard do not have NVGs for their SAR helicopters, and not all RN SAR helo’s are NVG equipped.

**Call-out Procedure**

The helicopter should be alerted at the earliest opportunity if there is the slightest chance of it being useful. A recall does no harm to anyone. Requests by RAF MRT’s are made direct to the ARCC who will deploy the most suitable flight. On any operation, accurate information is essential, and by passing the correct details to the ARCC, the team will be giving considerable help to the helicopter crew.

The following information should be passed to the ARCC:

a. Position and nature of the incident.

b. Weather conditions on scene - cloud base, wind and precipitation, freezing level.

c. Person in charge, his position and grid reference.

d. Radio frequency and callsign.

e. Progress to date.

f. Nature of injuries (if known).

In many cases the helicopter is called to a rendezvous for briefing. At this stage a written brief and marked map giving the following details is most helpful:

a. Location of casualty/team in 6 figure grid reference.

b. Estimated height of incident above sea level.
c. Plan of action and progress to date. If immediate pick up is not possible, estimate time of ground party getting below cloud or to suitable pick up area.

d. Details of casualty and medical help available.

e. Type of stretcher in use.

f. Details of team and equipment movements requested of the helicopter.

It may be beneficial for the Helo to proceed direct to the search area. This decision is the sole responsibility of the aircraft Captain. Searches carried out in daylight far exceed NVG searches in efficiency unless the casualty is known to have a torch or other light source.

There may be occasions when to save time this briefing must be passed by radio. For landing sites that are not normally used, either a vehicle flashing light or a hand held strobe light should be positioned at the edge of the landing site (however - see night operations). Smoke in the form of Day / Night flares should also be provided if available.
Fig 53: The Clock method of “Talking in” a Rescue Helicopter

Radio Calls

MAN A “I’m in your 12 o’clock low one kilometre”.

MAN B “I’m in your 4 o’clock high three quarters of a kilometre”

MAN C “I’m in your 6 o’clock same height”.

8-8
Helicopter Reaction

Maintains course but descends until MAN A says “12 o’clock at same height”.

Turns to its 4 o’clock and climbs until MAN B says “12 o’clock same height”.

Turns 180° and maintains height. MAN C transmits when helicopter is at 12 o’clock”.

Helicopter Landing Sites

The ideal landing site for a helicopter is about the size of a football pitch. The diagram below gives some idea of the site requirements.

---

**FIG:54 Helicopter Landing Site Requirements**

a. The Landing surface should be firm (a Landrover should be able to stop and move off again without sinking).

b. The Landing surface should be as level as possible.

c. The Landing site should be free of overhead obstructions.

d. The Landing site should be FOD free.
**Night Landing Sites**

Landing a helicopter at night in a remote, unlit mountain environment is potentially dangerous and unless the pilot has made a thorough reconnaissance of the Landing Site (LS), he will be most reluctant to land there. However, if the MRT Leader is aware of the factors which the pilots need to consider, and has recce’d the area himself, the pilot may be persuaded to make a precautionary (or “dummy”) approach which he will convert to a landing if he is happy.

The vital factors are as follows:

- **WIND** - Direction and strength.
- **SIZE** - Ideally as big as a football pitch but may be as small as a tennis court.
- **SHAPE** - Note the shape and tell the pilot.
- **SURROUNDINGS** - No WIRES, PYLONS, TREES, BUILDINGS, on the Approach or Overshoot.
- **SURFACE** - If boggy, warn the pilot and check FOD risk; remember, polybags and wriggly tin kill helicopters.

Under “white light” conditions there are two recognised methods of identifying a landing site at night. These are the rarely used NATO “T” and the use of crossed vehicle headlights; however as the aircraft approaches, identify yourself by radio. Unless the pilot tells you otherwise ASSUME THAT NIGHT VISION GOGGLES ARE IN USE (see Annex B).

**Crossed Headlights**

One member of the team should stand in the position most suitable for the landing site with his back to the wind, to indicate the approach line of the aircraft. Two vehicles are then positioned 35 metres downwind, 17.5 metres either side of the centre line as shown. The headlights of the vehicles should point at the position where the man is standing.

When the helicopter is in sight, activate the blue lights for a few seconds to attract the attention of the pilot and then leave them switched off. The layout should look like this:

If the terrain is very wild and steep and a landing is obviously impossible, tell the crew; mark your position and give your altitude. They will then make a cautious approach and assess the possibility of hover-jumping or winching, but at night this is extremely difficult.
Fig 55: Use of Crossed Headlights
Helicopter Communications

All RAF SAR helicopters are fitted with radios compatible with MRTs. However, radio silence may be called for during hovering / winching operations.

Remember, several frequencies (RCC HF, Air Traffic etc) in addition to yours are being monitored by the aircrew, so keep transmissions not pertinent to the incident to an absolute minimum.

<table>
<thead>
<tr>
<th>SAR AIRCRAFT CALLSIGNS</th>
<th>Base / Type</th>
<th>Callsign</th>
<th>Training Prefix</th>
<th>SAROPS Prefix</th>
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<tr>
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<td>137/138/139</td>
<td>Sierra Romeo Golf</td>
<td>Rescue Helicopter</td>
<td></td>
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<tr>
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<td>131/132/133</td>
<td>Sierra Romeo Golf</td>
<td>Rescue Helicopter</td>
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<td>Navy</td>
<td>Rescue Helicopter</td>
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<td>Rescue Helicopter</td>
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<td>Navy</td>
<td>Rescue Helicopter</td>
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</tbody>
</table>

Emergency Drills

The Sea King helicopter is a robust, twin engined aircraft, with a first-class safety record. In the unlikely event of an emergency, the following procedures should be adopted:

a. Follow the directions of the crew.

b. Secure any loose equipment, putting it under seats or feet.

c. Ensure your seat belt is tight, legs 90 degrees, hand behind your knees and head down.

d. On hearing the call “BRACE BRACE” prepare for a series of impacts.

e. Remain strapped into your seat until told to move by the crew.

f. Move out quickly for at least 50 metres upwind - then check that everyone is out.
Emergency handles and window jettison tags are coloured YELLOW and BLACK. Additionally, in the RAF Sea Kings, all the cabin windows are jettisonable and can be used as escape exits. Each window has a large ring on the red tab, normally located at the top. By pulling the tab the window seal is cut and should easily be pushed out. (See Annex C).

Fig 57: Sea King - Safe Approach Sectors
Fig 59: Beware of these Danger Zones!
Annex A:

SAR HELICOPTER SPECIFICATIONS

**FIG: 60  RAF Sea King**


**FIG: 61  Sikorsky S61N**

Annex B:

WORKING AT NIGHT WITH HELICOPTERS USING NIGHT VISION GOGGLES

Introduction

Description

a. Night Vision Goggles (NVG) are lightweight light-intensifying binoculars which are worn strapped to the front of aircrew flying helmets to allow hands-free operation.

b. They work by amplifying whatever light is available from external sources and can function in conditions of only starlight.

Performance

NVG greatly enhance a helicopter crew’s ability to operate safety at night; given the right conditions a lighted cigarette can be seen from over a mile away. However certain conditions adversely affect their performance.

a. Moisture. The performance of NVG is affected by moisture in the air. Mist, cloud, falling snow or heavy rain will all reduce their effectiveness.

b. Artificial Light Levels. If too much light is directed at NVG they will “close-down”, producing the same effect as the naked eye being dazzled by car headlights at night (although the effect is only temporary; NVGs will recover more quickly than the naked eye).

 Procedures

These procedures are aimed at controlling the levels of artificial light in the vicinity of an NVGequipped helicopter whilst maintaining sufficient light to ensure safe operations on the ground.

As a general rule, never shine a light directly at a helicopter.

Indicating Your Position

When asked to identify yourself, use a flashing light to help to distinguish you from other personnel in the vicinity. A firefly is an ideal location aid for both conventional and NVG night work (the pulse is so short that it does not close the goggles down). However, a torch will usually be sufficient to identify your position and on a dark mountain it could be visible from 2 miles away. Once it is obvious that the helicopter crew has identified you and are approaching your position, shine a steady light, aimed at your feet and not at the helicopter.
Arrival at Landing Site or Winching Situation

a. As the helicopter nears the landing site or situation you should aim to reduce the amount of white light used to a minimum commensurate with your own safety. Switch off unnecessary lights. If it is unsafe for you to switch them all off advise the pilot, telling him how long you require, but keep lights pointing downwards if possible.

b. Flash photographs must not be taken near the helicopter. Stress the importance of this to all MRT members and be aware of onlookers at the RV.

c. If safe to do so, switch off vehicle lights. Flashing warning lights are especially disruptive to NVGs.

d. On the approach to the landing site the pilot will progressively convert to using the normal aircraft lights. These are carefully controlled to remain NVG compatible. Once these lights are all on, and the helicopter has landed or is established in the hover, treat the situation as normal.

Searching

An NVG search will be most effective in areas where there is little artificial light. If, during a search, you need to use parafires for ground illumination, inform the pilot of your intentions as the NVG will be ineffective in the bright light produced by the flares.

Emplaning / Deplaning

If you board a helicopter where the crew are using NVG do not use a normal torch inside the aircraft as this will adversely affect the NVG. A torch fitted with a blue / green filter is compatible with NVG operations and these should be available on the helicopter.

Departing from the Landing Site or Winching Situation

When the helicopter is ready to depart, the pilot will gradually switch off the aircraft lights to gain the maximum benefit from the NVGs. You should again reduce the amount of white light used, if possible and commensurate with your own safety, until the helicopter is well clear of the area.

Conclusion

NVG are not a cure-all for night mountain flying. However they do enhance the safety of operations if used correctly. Although an NVG-equipped helicopter is able to see far more than before, it does not mean that it can operate the same as in daylight and it is necessary to strictly control the amount of artificial light if the googles are to work to their maximum effect. By following these guidelines you will greatly assist the safe operation of helicopters at night.
Annex C:

SAR HELICOPTER SAFETY INFORMATION

Seat Belts

FASTEN

TIGHTEN

LIFT TO RELEASE

Life Jackets

1

2

3

TO INFLATE
PULL
RED
KNOB

ADULTS - DO NOT inflate life preserver whilst inside the aircraft.

CHILDREN - Inflate life preserver INSIDE the aircraft BEFORE tying tapes

Fig 63
Emergency Exits - SEA KING

Cargo Door Window

Crew Door (do not open lower section if in water)

FIG: 64

Cargo Door Window

PULL LEVER

PUSH WINDOW OUT

Crew Door (do not open lower section if in water)

PUSH LEVER

PUSH UPPER DOOR OUT

Windows

PULL RED TAG REMOVE SEAL

PUSH WINDOW OUT

FIG: 65