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Target Audience:  
FOD Inspectors  
Specialist Group Inspectors

## **PREVENTING FALLS FROM HEIGHT DURING MAINTENANCE AT HELICOPTERS (ROTARY WING AIRCRAFT)**

**This SIM replaces version 2, the revision has been made to bring the SIM in line with the Work at Height regulations 2005 - Please note that the title of this SIM has significantly changed from version 2.** This SIM provides guidance for inspectors on means of preventing falls from height during the maintenance and refinishing of helicopters, and the standards to be applied. The guidance covers both high falls and falls below head height and is designed to complement the guidance contained in the 'Falls from a height' topic pack. It should be read in conjunction with SIM 5/2002/52(rev), which outlines the general principles of safe access at aircraft and with OC 200/31 on the Work at Height Regulations 2005 (WAHR).

### INTRODUCTION

1 Maintenance work on helicopters may be major (deep maintenance) or consist of minor checks and repairs between flights (line maintenance). Access to heights on helicopters is also necessary to undertake routine pre flight checks by engineers and pilots. Engineering work on helicopters involves both routine maintenance and fault correction work both internally and externally. Maintenance normally takes place in a hangar or sheltered environment, but it could be required at locations that include airport aprons (line), designated 'Heli-pad' sites or in remote locations. Refinishing may involve paint stripping, cleaning and painting of all or part of the exterior of the aircraft and interior work.

2 Helicopters range in size from small (two seaters), to medium and large helicopters as used in the offshore industry and the troop/equipment transporters used by the Ministry of Defence (MOD). Their design and mobility allows access to areas without purpose built runways or landing strips. They are therefore used by the military, civil, emergency and search and rescue (SAR) services to access remote areas.

3 The environments in which deep maintenance and line maintenance take place can be very different. Deep maintenance usually takes place in hangars,

offering protection against the weather and control over vehicle movements. Line maintenance and pre flight checks may take place outdoors on a hard standing or aircraft apron, or in remote locations with few if any facilities, and in extreme weather conditions.

4 The access requirements for engineering and refinishing can be very different. Refinishing work may require more extensive working platforms at levels not always ideal for engineering work and a space between the helicopter and the working platform. Providing safe access for all purposes requires careful planning. Access arrangements may also need changing as work progresses.

5 The hazards and risks of maintenance work on helicopters are broadly similar to those in maintenance of fixed wing aircraft, including those created by the non-linear shape, when paras 12-14 of SIM 5/2002/52 (rev) are relevant.

6 A principal difference is that helicopters have integral access steps and working platforms as part of the airframe to allow access to the rotors, engine and drive shaft to facilitate maintenance. Aircraft steps and platforms should be coated with non-slip surfaces affording better grip when ascending/ descending and working at height. These surfaces are subject to inspection by approved engineers as part of the authorised daily aircraft check requirements

7 Design of access varies dependent on the size and design of individual helicopters. In general terms, the larger the helicopter, the more substantial the integral steps and platforms are likely to be. While such steps and platforms may be suitable for minor repairs and maintenance when work platforms are not available, this is not usually the case for major work.

8 Another significant difference is that, due to the higher maintenance factor involved in keeping helicopters safe and serviceable, the exposure to hazards such as work at height is far higher, with more frequent servicing requirements than fixed wing aircraft. Considerable differences exist between manufacturers' maintenance procedures for all helicopter types/ variants. Maintenance requirements are also subject to the role the helicopters are utilised for, i.e. offshore, aerial-work (e.g. photography), search and rescue (SAR), police/ambulance services and military operations.

9 Although helicopters tend to be smaller than many aircraft, the height of their rotor assemblies and other mechanical parts can still pose a significant risk of injury from a fall. This is particularly the case if manual handling of such components at a height is necessary, for example during the removal of major components or their assemblies.

10 The presence of rotating blades and other dynamic assemblies present additional hazards and risks in both access and maintenance activities. As with fixed wing aircraft there is also an emphasis on avoiding any damage to the skin and structures for airworthiness reasons.

11 Inspectors should also be aware that Civil Aviation Authority (CAA) and international\* aviation legislative requirements are imposed on aircraft/helicopter operators, including requirements relevant to the inspections mentioned in para 5. Aircraft engineers are highly trained and may be certified for specific aircraft/ helicopter types. Type training and refresher training is currently governed in the UK by Joint Aviation Requirements (JAR-147 and JAR-66). Type training can take 5 years and refresher training covers technical issues.

\* (Federal Aviation Authority, Joint Aviation Requirements, European Aviation Safety Agency)

12 Those conducting maintenance tasks or flight checks on aircraft have a duty and legal responsibility to maintain flight safety. The risks to an individual must be controlled so far as is reasonably practicable, but must be weighed against the comparative risk of jeopardising flight safety and endangering lives.

## LEGAL REQUIREMENTS

13 This SIM highlights specific risks associated with work on helicopters and the precautions and standards to be expected. OC 200/31 provides a general guide to WAHR including the hierarchy of controls that should be considered for controlling risks that arise from working at height. This hierarchy should be applied to helicopter maintenance as for any other work at height situation. However there will be some situations where avoiding work at height is not an option.

14 See SIM 05/2002/52 (rev) para 6 for a list of relevant legal requirements.

## TYPES OF ACCESS EQUIPMENT

15 A wide range of access equipment is used in the industry, including decking customised to fit all or part of the helicopter, adjustable decking for specific parts (the cockpit or tail, for example), various types of scaffolding towers, platforms and steps, and mobile elevating work platforms (MEWPs). The latter are used as temporary working places giving access to localised work areas. They are known by a number of different names including cherry pickers, scissor lift work platforms, hydraulic work platforms, mobile work platforms, mobile access platforms and aerial work platforms.

16 Premises dealing with a fleet of similar helicopters may have customised decking and scaffolds specifically designed to provide access to all the necessary parts of the helicopter. However, where a site deals with a wide range of types, sizes and designs of helicopter, a range of stands or flexible purpose access equipment will be necessary.

## GENERAL PRINCIPLES

17 General principles of access to aircraft during maintenance are given in SIM 5/2002/52 (rev) paras 10 –14. The same principles apply to safe access to

helicopters, subject to the additional information contained in the following sections of this SIM. Larger helicopter operators should generally have customised access equipment.

18 One of the main problems in providing safe access to helicopters where customised access equipment is not available, is the need to follow the rounded body shape; to allow for protrusions such as winches, aerials, handles, steps and other specialist equipment; and allow for rotor movement where necessary. Considerable attention to detail is needed to ensure that significant gaps between the helicopter and the working platform are avoided where possible, and that the risk of falls is minimised where gaps cannot be avoided. Use of integral access steps and platforms must be carefully assessed and should in any case only be used for short duration work due to their limited dimensions and a general lack of edge protection.

19 A risk assessment should be carried out of all work undertaken from a helicopter's integral work platform to identify significant risks of falls. This may consist of generic risk assessments for certain activities or access needs, with dynamic risk assessment of specific aspects such as weather conditions. Any such risks should be addressed where possible by the use of additional platforms or guard rails adjacent to the work platform, or the use of alternative fall protection equipment or methods. The principle of '3 points of contact' while ascending and descending ladders can be assisted by the provision of suitable tool belts and arrangements for tools and equipment to be raised and lowered to/from the workstation.

20 There are considerable limitations on the use and suitability of personal fall protection systems (PFPS) on helicopters, including availability of air frame attachment points that are rated for fall arrest (i.e. strong enough), actual height of work, the risk of hitting obstructions on the helicopter in a fall, and the additional safety risks introduced in attaching and using harnesses. Aircraft structures and components are subject to stringent design requirements and attachment points can only be provided according to manufacturers' specifications and approval. There are also aircraft safety issues related to possible damage to components by harnesses and clips, for instance slight damage to a rotating assembly could induce catastrophic stress failure. See appendix 7 paras 1 to 10 of OC 200/31 for a definition of PFPS and associated terms.

21 Helicopters in general are not currently designed for the use of PFPS. If such equipment is to be used consideration must be given to the potential for damage inducing a critical flight system failure. Maintenance tasks frequently require more than one worker, which introduces additional problems of harness attachment and tripping risks. Where PFPS is used the guidance contained in paras 30 - 35 must be met.

22 Suitable non-slip footwear is important and some trials have been undertaken of head protection which could reduce the risk of head injuries in a fall, without restricting movement, access and awareness of surroundings

during routine working. HSE currently has no definitive guidance on the acceptability or effectiveness of such head protection.

## FOLLOWING THE AIRCRAFT SHAPE

23 See SIM 5/2002/52(rev) paras 12 – 14 for general guidance.

## CONSIDERATIONS WITH PARTICULAR ACCESS METHODS

### Use of MEWPs

24 Guidance on the use of MEWPs is given in SIM 5/2002/52 (rev) paras 16-17 and 29-34, Information Sheet MISC614 'Preventing falls from boom-type mobile elevating work platforms' and OC 314/20.

### Portable access steps and platforms

25 Guidance on the use of access steps and platforms is given in SIM 5/2002/52 (rev) paras 18-21.

26 British Standard BS EN 1915 –1:2001 applies to basic safety requirements for aircraft ground support equipment; BS EN 12312:2005 part 8 deals with specific safety requirements for maintenance stairs and platforms.

### The aircraft as a working platform

27 In cases where general access or tower scaffolding is not available in the area, it is necessary to work using the helicopter's integral steps and platforms as a working platform. These can include some line maintenance or pre flight checks on the apron or in remote areas. However undertaking such work from a helicopter's own access steps has on occasion resulted in falls involving major injuries. Such work should therefore be subject to risk assessment and measures taken to reduce the risk of injury so far as is reasonably practicable.

28 The hierarchy of controls defined in WAHR is listed in OC 200/31, paras 77-92. Possible solutions for helicopters might include:

- 1) Avoidance — for example, by using poles for cleaning.
- 2) Existing safe place of work, for example, integral work platforms if they have adequate edge protection.
- 3) General access, tower scaffolding or MEWP's in the area to be worked on wherever possible
- 4) Using suitable personal work restraint equipment anchored to a suitable anchorage point on the helicopter, subject to the restrictions outlined in this SIM.

5) Airbags

6) Fall arrest

7) Ladders or other additional suitable and sufficient measures to prevent a fall (bottom of the hierarchy)

29 It is important when using the measures in para 28(3) to ensure that the scaffold or MEWP will remain stable should someone fall against or into the platform. In some cases it may not be possible to manoeuvre large stands, and the use of such stands or MEWPS outside hangars may not be practicable or may be prohibited by airfield regulations due to the risk of aircraft damage, traffic levels, helicopter downwash, inadequate lighting levels and Foreign Object Debris (FOD) risks. Stability of the MEWP and suitability of any anchorage point within the basket to withstand the forces imposed by a person falling must be considered, along with the guidance in para 24.

#### Harnesses and lanyards

30 The provision of equipment with edge protection may not be reasonably practicable for some tasks of short duration. It may also not always be possible to carry out such activities from a MEWP. In such circumstances the use of PFPS connected to a suitable anchorage point may be an acceptable solution. Use of work restraint systems and anchorage points on aircraft are subject to CAA and manufacturers' approval.

31 The employer needs to be clear about what the fall protection is required to do and should base their decision of what type of equipment to use on a risk assessment of the work to be done taking into account the type of helicopter involved and the location of the work.

32 Primarily because of the distances necessary for the safe deployment of fall arrest equipment (Usually in excess of 5 metres) it is unlikely to be suitable for work on most current helicopter types. Consequently, when inspectors encounter fall arrest equipment being used during maintenance work on helicopters they should question its use and verify that sufficient consideration has been given to the fall height required for the particular fall arrest system to stop a fall. This is the case regardless of the size of helicopter involved. Fall arrest equipment is subject to the inspection requirements of Reg 12 of the WAHR and Reg 7 of the PPE Regulations that lays out the requirements relating to maintenance. Equipment should be inspected as detailed by INDG 367 'Inspection of fall arrest equipment made from webbing or rope'.

33 PFPS (including any horizontal lines used for anchorage) need to be properly designed, installed, maintained, and kept well adjusted and their use should be closely supervised. Users must be trained in use of the equipment to a proficient standard and the employer should also consider and plan how a worker wearing a harness will be rescued should they fall. Making provisions for rescue is a requirement of WAHR.

34 Anchorage points may be on the helicopter (if authorised), access platform or may be part of the equipment of the hangar. In exceptional circumstances a MEWP may be a suitable anchorage point for work carried out from the helicopter's own work platform (see para 24). The majority of anchorage points on MEWPs are currently rated for work restraint and not fall arrest. Employers should seek confirmation of this issue from the MEWP supplier prior to using a MEWP as an anchor for fall arrest. In some cases certain items of ground support equipment such as maintenance stands may not be permitted in apron areas due to flight safety requirements, specifically susceptibility to the downwash of large helicopter types.

35 Safe access must be provided to attach the harness to the anchorage point and will also be required during work on the anchorage points themselves. The use of PFPS has limitations, for example with work restraint the helicopter access platforms may be too narrow to prevent a person getting into a position where they can fall; and with fall arrest there may not be sufficient clearance height for the system to operate or the anchor may not be strong enough. Because of this PFPS should only be considered as a last resort supported by a risk assessment that establishes the system can be effective. Where this cannot be established PFPS should **not** be used as it gives a false sense of security. In such situations other available means of access and or protection should be assessed and the most suitable used for the specific task.

## INSPECTION AND MAINTENANCE OF ACCESS EQUIPMENT

36 See the guidance in SIM 5/2002/52(rev), paras 36 – 49.

## COMPETENCE

37 Employers should not allow anyone to engage in any activity in relation to work at height unless they are competent to do so. This includes the organisation, planning and supervision of work at height. A British Standard is being developed on training for work at height.

38 Competence is dealt with in OC 200/31 Appendix 8. Training for those assembling, dismantling or significantly altering scaffolding is outlined in WAHR Schedule 3, part 2, paragraph 12.

39 Supervisors and managers will need more in-depth training and must be able to recognise any inadequacies in equipment and work practices.

40 Where a company has specialist equipment, including equipment designed and constructed for use with only one type of aircraft or limited types, staff should be sufficiently competent to recognise and select the right equipment for the aircraft and task at hand.

41 The levels of training and competence of aircraft engineers should be taken into consideration (see para 11).

42 There should be checks of equipment (harnesses, MEWPs, etc.) by users, inspections by competent persons, as well as any statutory inspections required by LOLER and the Work at Height Regulations. This is all in addition to any maintenance that is specified by the manufacturer.

## INTERFACE WITH THE CIVIL AVIATION AUTHORITY (CAA)

43 See SIM 5/2002/52(rev) paras 54 –57. Inspectors should also liaise with CAA counterparts if they believe there are areas of joint interest. They should contact the Transportation Section if they come across demarcation areas not adequately dealt with in the MoU.

## FURTHER ADVICE

43 SIM 5/2002/52(rev) and relevant British Standards have already been referred to in paragraph 25-26.

44 Other documents giving general advice on working at heights are listed at the appendix. There are also other British and European standards relevant to work at height. However, none of these are specific to aircraft access and will need to be interpreted in the light of the task and the law, as summarised earlier.

45 Advice on enforcement is given in paras 50 - 64. The table describes a number of scenarios that inspectors may encounter where helicopter maintenance is being carried out. The tables are intended to help inspectors when they are considering enforcement. The tables are for guidance only. Any enforcement should be determined by the circumstances found on site.

46 Advice on aircraft maintenance can be obtained from:

- Transportation Section, where it takes place at airports;
- Defence, Fire and Police unit where it is at military bases;
- Manufacturing Sector at other locations.

Current phone numbers may be found in the staff directory.

47 The Transportation Section is prepared to provide expert evidence on standards of safe access for aircraft maintenance, if required.

## ACTION BY INSPECTORS

48 Inspectors are requested to:

- apply the standards detailed in this SIM when inspecting or discussing maintenance work at heights on helicopters;

- alert the Manufacturing Sector and Transportation Section to any problems which arise from applying these standards, or any of the other advice contained in this SIM;
- draw to the attention of both the Manufacturing Sector and Transportation Section any new or innovative means of gaining safe access or fall protection during maintenance work (e.g. use of head protection, air mats, new designs of flexible access equipment);
- advise CAA of any matters of concern relating to the safety of aircraft uncovered during inspections or investigations at aircraft maintenance companies;
- include the words **Regulatory liaison** with CAA in appropriate Contact reports when contacting CAA to raise an issue of concern.

49 As part of a longer term strategy the Transportation Section will be engaging with aircraft manufacturers and designers to raise awareness of health and safety issues, and inspectors are encouraged to enquire into manufacturers' guidance and employee training programmes to ensure that safe access is covered as part of routine training.

## ENFORCEMENT GUIDANCE

50 The following is a guide to when enforcement action may be appropriate. It is based on Operational Version 3 of the Enforcement Management Model (EMM) and applies to situations where there is a risk of falling with the potential to cause injury. Any action should reflect any subsequent changes to EMM. The final decision on enforcement action should also take account of duty holder factors and the strategic factors outlined in paras 65 and 66.

### Overview

51 The relevant hazard is falls from a height during maintenance/repair work on helicopters.

### Actual risk

52 Injuries sustained as a result of such falls have included multiple injuries resulting in death, head injuries and fractured limbs. Such injuries have occurred where the IP has fallen from less than head height. High falls and falls below head height are therefore both considered a hazard.

53 There have been a number of fatal accidents reported to HSE where MEWPs have been struck by vehicles, the MEWPs have failed, or the ground has given way under a wheel. Around 30% of investigated incidents were due to equipment failure, and another 30% due to ground conditions

## Assessing the risk

54 Inspectors may encounter work at a height on helicopters when undertaking inspections/investigations. In such situations only the inspector concerned can make an assessment of the actual risk arising from this work. The following may however, assist in carrying out this assessment.

55 The Manufacturing Sector and the Transportation Section are aware of only a small number of incidents involving falls from a height during maintenance/repair work on helicopters. However, the injuries sustained in every case have been serious or even fatal, sometimes involving head injuries or multiple fractures, both for high falls and falls below head height. A fall of 1.2 m from a helicopter's integral access steps, for example, resulted in loss of consciousness and head injuries. The potential for serious injury is therefore the same for high and falls below head height although the risk of a fatality is likely to be greater from falls above head height.

56 The risk of a fall will depend on various factors including:

- The work that is being done, for instance whether it involves handling awkward or heavy loads or applying a force such as loosening a nut, which could result in a person overbalancing.
- The duration of the work and the location in which it is carried out. If carried out externally there may be impact from the weather conditions.
- The surface on which the person is standing whilst working, including its angle, its level of slip resistance and the actual surface area available.
- The availability and adequacy of any existing fall protection measures should also be taken into account.

57 The guidance in OC 200/31 will help inspectors to determine the level of risk when they find inadequate precautions to prevent a fall from height. In many cases this will be a serious risk of serious personal injury. In such cases inspectors should consider the specific factors detailed in this SIM and consider issuing a prohibition notice as discussed in Section 4 of the EMM. Action to reduce the risk could be as simple as repositioning existing guardrails on work platforms, or using tower scaffolds or MEWPs as a working platform

58 Consideration should be given to risk control systems for equipment procurement, maintenance and thorough examination, as well as training in selection and use of equipment, systems for maintaining edge protection and restricting access to unguarded docking, and management control of contractors.

59 Given the potential for injury it is essential that a suitable and sufficient risk assessment be carried out. To be suitable the assessment should consider the issues raised above. The assessment should recognise the potential for serious injury arising from low falls as well as high falls. The failure to undertake a risk assessment should be dealt with by reference to table 5.2 of the EMM.

#### Benchmark

60 Where there is a risk of injury due to falling from height the benchmark should be considered as a 'remote risk of serious personal injury'. If it is reasonably practicable to provide edge protection, the benchmark should be achieved by providing the standards at paras 15 - 35.

61 Where customised docking is in use without adequate means to prevent access or falls, the benchmark should be considered as a 'remote risk of serious personal injury'. The benchmark should be achieved by providing the measures at paras 17 - 22.

62 Where there is work from heights at below head height, the benchmark should be considered as a 'remote risk of serious personal injury'.

#### Risk gap

63 The risk gap as derived from EMM Table 2.1 for key scenarios that inspectors may encounter is summarised below. The examples given are however for illustrative purposes only. Inspectors must come to an enforcement decision that is based on what they find in any given situation.

<b>Scenario</b>	<b>Actual risk</b>	<b>Risk gap</b>
Inadequate edge protection at height	Probable risk of serious personal injury	Substantial
Misuse of MEWP's	Probable risk of serious personal injury	Substantial
Work at height below head height in any location	Possible/probable risk of serious injury	Moderate/substantial
Work from customised docking and proprietary scaffolding equipment away from the aircraft body such that there is an unprotected open edge	Probable risk of serious personal injury	Substantial
Work restraint or fall arrest not worn or not clipped on	Probable risk of serious personal injury	Substantial
Poorly maintained and/or damaged access equipment	Probable or possible risk of serious personal injury	Substantial

or missing edge protection	– depending on nature and extent of lack of maintenance / damage.	
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#### Initial enforcement expectation (IEE)

64 The following are relevant in deriving the authority for standards for use in EMM table 5.1 and hence for deciding the IEE.

Work at Height Regulations 2005	Defined
LOLER 1998 reg 5(1)(b) and ACOP para 144; reg 9.	Defined
PUWER 1998 reg 8 and 9	Defined
Workplace Regulations 1992 reg 5(1)	Defined

#### Strategic factors

65 Falls from a height are currently a HSC priority programme. A failure by inspectors to take enforcement action where the EMM and local factors indicate such action to be appropriate may have a negative impact upon employers' attitudes. This should be considered as a strategic factor for the purposes of the EMM.

66 Requirements of the Air Navigation Order should be taken into consideration, in relation to the requirements to avoid endangering an aircraft or compromising aircraft or flight safety. Transportation Section can give further advice, if required.

Date first issued:

APPENDIX  
(para 15)  
GUIDANCE AND REFERENCE MATERIAL

Airside Safety Management CAP 642

The Work at Height Regulations 2005: a brief guide INDG 401

The Work at Height Regulations 2005. OC200/31

Tower scaffolds. Construction Information Sheet No 10 (Rev 4)

General access scaffolds and ladders. Construction Information Sheet No 49.

Inspecting fall arrest equipment made from webbing or rope INDG367

Safe use of ladders and stepladders. INDG 402.

Top tips on ladder and stepladder safety. INDG 405.

Preventing falls from boom-type mobile elevating platforms HSE Information Sheet 614

Prevention of falls from mobile elevating work platforms and selection and use of fall protection equipment OC 314/20

Memorandum of Understanding between HSE and CAA

BS EN 1915 –1:2001. Aircraft ground support equipment. General requirements. Basic safety requirements

BS EN 12312 – 8:2005. Aircraft ground support equipment. Specific requirements. Maintenance stairs and platforms.