

Revision 0

Helicopter External Load Operations

DATE

General

Civil Aviation Authority (CAA) Advisory Circulars (ACs) contain information about standards, practices, and procedures that the Director has found to be an **acceptable means of compliance** with the associated rule.

Consideration will be given to other methods of compliance that are presented to the Director. When new standards, practices, or procedures are found to be acceptable they will be added to the appropriate AC.

Purpose

This AC outlines CAA's expectations of operators who are carrying out external load operations conducted under Civil Aviation Rule Part 133, *Helicopter External Load Operations*. In summary, CAA expects evidence that operators are:

- only using external load equipment that has been designed and manufactured and installed to the appropriate standards, and
- maintaining and inspecting external load equipment to preserve the necessary operating safety margins.

It also highlights areas of concern that CAA inspectors have raised, and issues for operators to be mindful of when planning their operations and managing risks.

Related Rules

This AC relates to Part 133, Subparts B, *Operating rules and related requirements*, F, *Instruments and Equipment*, and G, *Maintenance*.

Change Notice

This is the initial issue of this AC.

Version History

History Log

Revision No.	Effective Date	Summary of Changes
AC133-1, Rev 0		Initial issue

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Introduction

This AC aims to outline common areas of concern and highlight acceptable standards for operators running operations involving helicopter external or underslung load operations. It covers specific rules which benefit from further explanation and clarification, in the section under Subparts A, B, F and G below.

Because of the complexity of these operations, operators need to effectively manage all these issues to ensure successful and safe external or underslung load operations. Controls and processes that will manage the risks arising from these operations need to be managed cohesively under a safety management system to be fully effective.

The focus in this AC is rules that are most misunderstood or prompt the majority of questions to CAA specialist teams. Where the meaning of a rule is self-evident, it has not been covered.

There are also more general sections of recommended good practice.

Note: Only rules which need clarifications are covered in this AC. Where a rule is self-explanatory it has not been included.

Abbreviations and Definitions

Abbreviations

While some abbreviations used in this AC are standard abbreviations from Part 1, *Definitions and Abbreviations*, they have been listed here for convenience.

Abbreviation	Meaning
ACOP	Approved code of practice
AD	Airworthiness Directives
AFM	Aircraft flight manual
ASME	American Society of Mechanical Engineers
CRM	Crew resource management
DG	Dangerous goods
DOM	Date of manufacture
FMS	Flight manual supplement
IAW	In accordance with
ICA	Instructions for continuing airworthiness
ICAO	International Civil Aviation Organization
MBIE	Ministry for Business, Innovation and Employment

OEM	Original equipment manufacturer
PIC	Pilot in command
RTS	Release to service
SMS	Safety management systems
SOP	Standard operating procedures
STC	Supplemental type certificate
SWL	Safe working load
TA	Territorial authority (e.g. local or regional council)
UL	Ultimate load (i.e. the breaking load or failure point of a material)
VNE	Never exceed-speed
WLL	Working load limit

Definitions

Definition	Meaning
Component	<p>Any instrument, mechanism, equipment, part, or accessory, including an airframe, aircraft engine, or propeller, that:</p> <ul style="list-style-type: none"> • is used, or is intended to be used, in operating or controlling an aircraft in flight, or • is installed in or attached to the aircraft, and • has a part number or a serial number allocated by the manufacturer, unless the manufacturer has designated such an item as a standard part.
Congested area	Any area which is substantially in use for residential, industrial, commercial, or recreational purposes.
Dangerous Goods	<p>Articles or substances capable of posing a hazard to health, safety, property or the environment:</p> <ul style="list-style-type: none"> • Class 1: Explosives • Class 2: Gases • Class 3: Flammable liquids • Class 4: Flammable solids; substances liable to spontaneous combustion; substances which, on contact with water, emit flammable gases. • Class 5: Oxidizing substances and organic peroxides.

	<ul style="list-style-type: none"> • Class 6: Toxic and infectious substances. • Class 7: Radioactive material. • Class 8: Corrosive substances. • Class 9: Miscellaneous dangerous substances and articles, including environmentally hazardous substances.
Dogman	A ground crew member of an operation with experience slinging loads, who can ensure the load is safely rigged for lifting. While most dogman courses in New Zealand are about crane safety, they can be useful for helicopter operations.
Essential person	<p>A person with an assigned role in an operation, such as:</p> <ul style="list-style-type: none"> • an air operator employee aircraft maintenance technician, or aircraft maintenance technician under hire and reward • a fire fighter or fire control officer being carried within a forest fire area, or • someone being carried to an aerial work site, who performs an essential function in connection with the aerial work operation and is necessary to accomplish the aerial work operation. <p>Note: <i>This is distinct from the Part 1 definition of Crew member.</i></p>
External load operations plan	<p>A detailed proposal to operate an aircraft carrying a jettisonable external load over a congested area at altitudes and distances less than those specified in Part 91, <i>General Operating and Flight Rules</i>, or to conduct a take-off, approach or landing within a congested area. This is required for:</p> <ul style="list-style-type: none"> • an external load operation • a dispensing operation, or • a task specialist operation, <p>but not for:</p> <ul style="list-style-type: none"> • a medical transport operation, or • an aerial application operation including any external load operation undertaken as part of that operation to apply fire retardants, including any chemical wetting enhancement agents or water. <p>The plan needs to include, among other things:</p> <ul style="list-style-type: none"> • location of the operation • type of aircraft to be used • dates, alternate dates and proposed time of day of the operation • a chart depicting flight routes and altitudes

	<ul style="list-style-type: none"> • plans for of avoiding obstructions in flight • actions to be taken in the event of a serious malfunction of the helicopter to ensure no hazard is created to persons or property on the surface including locations of forced landing areas in the event of an emergency • established and practiced plans for: <ul style="list-style-type: none"> ○ notifying the appropriate TA ○ complying with any requirements made by the TA ○ giving prior notice to the public and other third parties of the operation, and • name of responsible air operator person to contact.
Fast roping	See 'rappelling (or abseiling) operation'
Hoist	An approved lifting and lowering device attached to the exterior of a helicopter and is used for embarking, disembarking of cargo or persons from/to a helicopter in flight.
Lashing	Equipment used to secure equipment within a designated load but of insufficient material specification to be used as part of the lifting system.
Rappelling (or abseiling) operation	The lowering of a person from an airborne helicopter by a fixed line attached to the helicopter. The person remains in control of their descent. Also referred to as 'fast roping'.
Rated strength	Same as WLL
Sling load operation	The external carriage, lowering, or picking up, of a load, cargo, or passengers from a helicopter by means of a bucket, net, harness, sling, or stretcher, suspended beneath the helicopter.
Supplementary crew ¹	<p>A person carried in addition to essential crew member to carry out specific tasks the PIC is unable to do, such as:</p> <ul style="list-style-type: none"> • operating the winch, or • observing the load, or • releasing the load, or • observing clearances, or • getting persons on and off the aircraft.

¹ Note this definition may be affected by changes to civil aviation rules proposed in the 2023 Notice of Proposed Rule Making for Assorted Issues.

Safe Working Load (SWL)	Older term for WLL (see below)
Technical Instructions (TIs)	ICAO Document 9284 Technical Instructions for the Safe Transport of Dangerous Goods by Air approved by ICAO under Annex 18 of the Convention.
Towing operation	Towing, lowering, and laying down of external cargo by a helicopter that remains in contact with the ground, including water or any other surface, e.g. wire stringing, during the operation.
Winching operation	Lifting or lowering objects, a person or persons to or from the helicopter by a winch or hoist fitted to the helicopter.
Working Load Limit (WLL)	<p>The maximum mass or force an item of lifting equipment is designed to support.</p> <p>The WLL accounts for the materials UL capability, the required safety factor applied during its design and any other factors such as the trigonometric angles and joining methods.</p> <p>Previously known as SWL or Rated Strength</p> <p>The WLL is the maximum load that can safely be applied in normal operations</p>

Subpart A – General

Rule 133.1 – Applicability

Part 133 prescribes rules that are addition to or subtractions from the general operating and flight rules in Part 91. This means that:

- Helicopters carrying external loads, must comply with Part 91 **except** where the requirement is modified by Part 133.
- Part 133 also imposes requirements additional to Part 91 on helicopters while carrying out external load operations.

Therefore, the rules in Part 133 need to be seen as additional to Part 91: by themselves they are not a complete picture of applicable standards.

Rule 133.5 – Pilot licence requirements

In most cases pilots performing helicopter external load operations need to have a commercial pilot licence (helicopter). The exception, in rule 133.5(a)(2) allows a current private pilot licence (helicopter), if the pilot has met flight training requirements in rule 61.153, for the carriage of sling loads.

Subpart B – Operating Rules and Related Requirements

Subpart B covers minimum operating standards for running helicopter external load operations.

Rule 133.51 – Minimum safe height

(b) Planning an operation

The operator and PIC need to take reasonable care to ensure that an external load operation will be planned in a manner that identifies all hazards likely to be encountered and modifies the flight plan, so these hazards are avoided. The ensuing flights needs to be done at height and in a manner that avoids all these hazards to any people or property. Though not mandatory, CAA highly recommended that operators develop an external load operations plan for each flight, to ensure this is done.

Part of this plan would be to ensure the flight will be conducted at a safe height, and on a route, that allows a jettisonable external load to be released and the helicopter to be landed safely, in an emergency, without risking damage to a person or property on the ground.

Rule 133.51 (a) & (b) Minimum Safe Height

The helicopter may operate below 500ft within 150 metres of a person vehicle or structure, (in a way contrary to rule 91.311, *Minimum heights for VFR flights*) **only** if:

- it is necessary for the external load operation, and
- reasonable care is taken to ensure there is no hazard to person or property on the surface.

The simplest and most effective way of meeting this rule requirement is by **not** flying over people or property unconnected with the operation while carrying an external load. Where overflight is unavoidable, however, it should only be conducted at a height that permits the helicopter, in the event of an emergency, to manoeuvre clear of persons or property before releasing the load and making a landing.

Rule 133.53 – Carriage of persons

(a) External load towing operation

There should be no persons onboard a helicopter unless they are essential to the **towing** operation. This could include monitoring the towed load where the pilot is unable to do so.

Note: Towing is a relatively uncommon operation, in comparison to sling load operations which are the subject of para (b) below.

(b) Sling load operation

The intent is to minimise the number of people exposed to the increased risk associated with an external load operation. There should be no persons onboard a helicopter sling load operation apart from the pilot and any person essential to the sling load operation.

Essential to the sling load operation means essential to the portion of the flight where the load is suspended and the second person is required during that time, for purposes such as monitoring the load and/or operating the emergency release because the pilot is unable to do so without their assistance.

A person may also be carried inside the helicopter if the person's presence on board is necessary to accomplish the onsite work directly associated with the load. Situations where this is appropriate include where that person is directing the PIC to the work site, or when transporting workers required at the aerial work site where there is no other feasible way do this.

However, while installing a radio mast on a remote peak would qualify, installing an air conditioner on a completed commercial building would be unlikely to do so, as workers can use the building's lift instead.

Operators can only use the 'essential worker' clause if the safety of the operation is not compromised. It is very important to bear in mind that many external load operations are conducted close to the helicopter's performance limits. If the additional weight of worker would compromise safety margins, they should be positioned separately from the load. (before or after)

The 'essential worker' clause cannot be used during a human sling operation carried out under rule 133.71.

All essential persons need to be provided with a standard safety briefing, which may include specific safety instructions or requirements relevant to the operational tasking at hand.

Note: Part 133 does not permit the carriage of passengers. Operations where passengers are onboard fall outside the scope of this AC and Part 133. They need to be conducted under a Part 119 certificate, and operators are advised to refer to AC119-3, Air Operator Certification - Part 135 Operations.

Rule 133.53(d)(2) – Carriage of person for training

The PIC can give dual instruction to another appropriately licensed helicopter pilot, including observation training flights without dual controls being fitted. However, a pilot under training is prohibited from receiving dual instruction in a commercial transport operation.

The pilot receiving training is to be assessed as competent to receive dual instruction, and the operator and PIC need to ensure that the safe operation of the aircraft will not be compromised. Key issues to bear in mind when planning a safe operation include, but are not limited to:

- how training aligns with instructions in:
 - two-crew external load training SOPs
 - CRM training, and
 - previously documented ground instruction, and

- specific hazards associated with the task identified (operations in the Height Velocity Curve, in-flight emergencies).

Rule 133.55(a)(b)(1- 4) – Managing risks to third parties

An External Load Operations Plan is needed to manage any risks to third parties and ensure that no load-bearing operation:

- causes danger to any person or their property, unless their consent has been specifically obtained, or
- carries a load suspended over a congested area or open-air assembly of people.

Rule 133.55 (b)(5) – Communication between PIC and ground crew

Since ineffective communication between the PIC and the ground crew at pick-up and drop-off points of an operation is a known hazard, the details of how this should be done needs to be covered in the pre-operations briefing.

Operators might also want to consider specialised training for ground staff, such as dogman courses.

Rule 133.57 – Weight limitations

PICs need to ensure they have checked the appropriate FMS in the AFM, to determine appropriate weight limitations.

In addition, due to the dynamic nature of flight, the way the flight is conducted can adversely affect the 'weight' experienced from the aircraft itself down through the aircraft to the hook. PICs need to be aware of this when flying underslung loads.

Rule 133.65 – Dangerous goods

'Certified handler' as defined in Part 92, *Carriage of Dangerous Goods*, is derived from the definition in the Hazardous Substances and New Organisms (Personnel Qualifications) Regulations (2001):

'approved handler' means a person who holds a current test certificate certifying that the person has met the requirements of these regulations in relation to an approved handler for 1 or more hazard classifications or hazardous substances.

An appropriate risk assessment must be carried out before the operation, which ensures that the external load operations plan:

- ensures only acceptable DGs are carried
- ensures the PIC is informed of the nature of any DG
- complies with ICAO TIs for packing and stowage, and
- complies with ICAO TIs and rule 133.65(b)(5)(i) for packing and carriage of DG.

Note: Also refer to Part 92, and the ACs in the 92 series, listed in the Further Resources section.

Rule 133.67 – Flight characteristics

The PIC is ultimately responsible for the safe operation of the aircraft in all configurations, including conducting external load operations. Therefore, the PIC must ensure that all operational equipment, including the hook installation on the aircraft and any equipment that flies on the hook (including the load), has been thoroughly inspected and found suitable for external load operations.

PICs should consult the appropriate FMS, in the AFM, for the proper visual inspection procedures, as well as functionality tests (electric and manual release) of both the cargo swing/belly hook, and a remote hook (if used). For the equipment flying from the hook, the instructions to users and a material state check should be carried out IAW manufacturer's instructions, derived from the relevant industry standards.

Personnel involved in inspection and testing are to be suitably trained, qualified and authorised in order to carry out this tasking IAW rule 133.305. Though Part 133 does not prescribe training beyond pilot qualifications in rule 133.5, potentially useful courses and training are listed in the section *Training recommendations*, below.

Rigging of the load must take into consideration the weight and stresses imposed by the flight characteristics and flight stability of the external load. In a stable hover, with the external load raised from the ground, the PIC must make the determination to accept the load as stable prior to moving away from the loading zone. If the PIC is not satisfied with how the load is settled, then the load shall be lowered, and rigging reassessed before continuing with planned external load operations.

Not all external loads fly in a stable manner, nor can all external loads achieve the helicopter's external load VNE in a stable state. The operator and PIC should consider incremental increases in airspeed, in conjunction with observations of the flight characteristics of external loads prior to flight, at external load VNE limits as published in the AFM.

The operator and PIC should also consider environmental conditions when determining whether the stability of the load would be affected, including the ability of the aircraft to achieve translational lift with an unstable load. If load stability cannot be assured and the safety of the aircraft and/or personnel and property would be compromised by an unstable external load, the flight shall be terminated and reassessed. The planned operation needs to be paused until the rigging allows for stable flight and environmental conditions to enable the operation to be completed safely.

Rule 133.69 – Operations over congested areas

As per the External Load Operations Plan, the PIC must have a plan for:

- avoiding obstacles in flight
- seeking consent from relevant TAs
- emergency plans in case of equipment malfunction in the air, and

- giving notice to the public of the planned operation before it occurs.

Plans for mitigating the risk of the operation can be developed through SMS processes.

Examples of effective public notices, include, but are not limited to:

- newspaper notices
- door knocking in the area
- radio advertisements
- flyer drops in letter boxes
- publicity and door knocking etc done by the customer who has commissioned the operation.

Rule 133.71 – Suspension of person beneath helicopter

To ensure that this can be carried out safely, the operator and PIC must

- develop a robust and accurate ‘Out of Ground Effect’ calculation is conducted and adjusted to incorporate the 90% allocation
- retain this calculation in the External Load Operation Plan
- give careful consideration to environmental conditions, such visibility, unfavourable winds, etc
- include the effects of environmental factors, as well as aircraft performance factors, in planning and risk management
- create and maintain SOPs that encapsulate this task in a sequential, methodical order that ensures the person in suspension is firmly affixed to the helicopter at all times while airborne, and
- define prescriptive tasks that require a supplementary or essential crew member to perform. i.e. duties which are impractical or impossible for the PIC to do safely while flying the helicopter.

Rule 133.73 – Supplementary crew member

Rule 133.73(a)(1)(i-iv) defines tasks a supplementary or essential crew member needs to perform, because it would be impractical, or impossible for the PIC to safely conduct these tasks while flying.

The harness referred to in (3) means a quick release carabiner, or quick release mechanism that can be accessed easily, for example attached at the front of the harness, not on the back.

Rule 133.75 – Crew member competency

Although not specific to part 133 operations, under SMS, the check or flight review in rule 133.75(b) needs to be documented in the operator's hazard register. Any shortcomings, i.e. hazards, and planned mitigations to manage or eliminate these shortcomings, i.e. risk management, need to be documented in this register, so they can be monitored and followed up regularly.

Subpart F – Instruments and Equipment

Subpart F identifies the equipment necessary to perform helicopter external load operations. The equipment detailed in Subpart F is additional to that detailed in Part 91.

Rule 133.255 (1) – Cargo hooks

The operator must not carry out external load operations unless the helicopter is equipped with a cargo hook approved by the manufacturer and installed in accordance with acceptable technical data, or installed as part of a design change approved under Part 21 Subpart C.

Rule 133.255 (2) – External load equipment

All external load equipment should be inspected and maintained in accordance with the requirements of the appropriate instructions for continuing airworthiness. Where commercial lifting equipment is used, the relevant OEM maintenance data, *Instructions to Users*, ADs and maintenance instructions should be referred to. Suppliers of commercial equipment should supply the relevant inspection documentation at purchase, and operators are advised to ensure that they receive the relevant documentation with the equipment.

It is vitally important that the relevant documentation for each item of lifting equipment is captured in the operator's records, and that any installation or inspection is carried out in accordance with the correct documentation.

Any equipment which fails any inspection criteria should be removed from service immediately and disposed of in a way which ensures it cannot be re-used.

Inspection of external load equipment is a task which may be performed by an appropriately trained pilot.

External load equipment (ropes, slings, cables, bridles and other equipment which attach the load to the cargo hook) is considered acceptable if it has been manufactured to one of the following standards:

- MBIE's Approved Code of Practice for Load-Lifting Rigging (ACOP for Load Lifting)
- ASME B30.12-2011 (Handling Loads Suspended From Rotorcraft), referenced from ASME B30.19-2014 (Slings – Safety Standard for Cableways, Cranes, Derricks, Hoists, Jacks, and Slings).

The equipment should be tagged or labelled to indicate its Working Load Limit (WLL) or Safe Working Load (SWL).

Note: While WLL is the current term used in the ACOP for load lifting, SWL is its equivalent and also acceptable.

The equipment should be identified by serial number or other means to identify its origin and date of manufacture (DOM).

The organisation should hold records and certification documentation corresponding to the identification on the equipment that verifies its manufacture to one of the above standards.

Equipment that is not appropriately identified should be removed from service.

Rule 133.255(2)(ii) – Carriage of human load

The operator should ensure that the WLL /SWL of any equipment used to carry people is at least 3.75 times the weight of the load.²

The operator's documented procedures for carriage of human loads should include either:

- a means to determine the weight of the crew person and equipment, or
- a conservative means of selecting external load equipment that guarantees a factor of safety greater than 3.75 times the weight of the load.

Equipment used to carry people that do not meet the additional safety margins imposed by this standard are not compliant with 133.255(2)(ii), should be removed from service immediately.

Rule 133.257(a) – Quick release devices

The operator is responsible for ensuring that equipment is safe for use at all times. The instructions for continued airworthiness included in the STC or modification documentation will include inspection or testing requirements which the operator should follow. Equipment which fails to meet any requirement in the ICA must be removed from service immediately and suitably identified or destroyed to prevent any further use.

Rule 133.257(b) – Weight-bearing capacity of quick release devices

The operator must ensure that the quick release device installed on the hook mechanism functions correctly with all configurations of lifting equipment used, and up to the maximum weight external load allowable. Any quick release mechanism must satisfy the requirements of Rule Part 21 Subpart N.

Operators should include the regular testing of the quick release mechanism up to maximum load in their maintenance schedule.

Rule 133.257(c) – Quick release system

Quick release systems are part of the approved design change under which the hook is installed. The installation of the hook and associated quick release system will be approved under Part 21 Subpart N. The quick release system must have two separate means of activation:

- one located on either the cyclic or collective so that it can be operated by the pilot without taking their hands off the primary control, and
- a second that is accessible to a crew member.

Occurrence reports submitted to CAA indicate that improperly placed, quick release switches can contribute to loss of the load events.

² Refer to the worked example at Appendix 3 in this AC.

Subpart G – Maintenance

Rule 133.303 – Maintenance requirements

The operator should ensure that the equipment associated with external load operations, including cargo hooks are being maintained in an airworthy condition. Maintenance requirements for lifting equipment may be found in the relevant ICA associated with a design change, or in the manufacturer's documentation supplied with commercial lifting equipment.

- The cargo hook is considered a component, as defined in Part 1, so any maintenance carried out on it must conform to Part 43, including the RTS.
- The external load equipment (ropes, slings, cables, bridles, and other equipment which attach the load to the cargo hook and are independent of the hook) are not considered a component, so are subject to the requirements in rule 133.307.

Rule 133.307(a) – Loading and inspecting external load equipment

The following standards provide acceptable criteria for visual inspection:

- MBIE's ACOP for Load Lifting (which can be found on the WorkSafe NZ website (and in the Further Resources section of this AC).
- ASME B30.12-2011 (Handling Loads Suspended From Rotorcraft), referenced from ASME B30.9-2014 (Slings – Safety Standard for Cableways, Cranes, Derricks, Hoists, Jacks, and Slings).
- Manufacturer instructions.

Note 1: CAA has published a [presentation](#) from a rigging equipment manufacturer that provides guidance on inspection. Appendix 6 of the AC also has examples.

Note 2: CAA has also updated its presentation [Inspections and safe use of lifting equipment - March 2022](#) Slides 9-11, 18, 19, 22-28, 31, 36, 37, 40-47 and 51-55 are of particular relevance.

Successfully completing a proof load test revalidates the equipment's declared WLL/SWL for one year. Operators should also comply with any life limitations stipulated by the equipment manufacturer, as some sling material may perish over time.

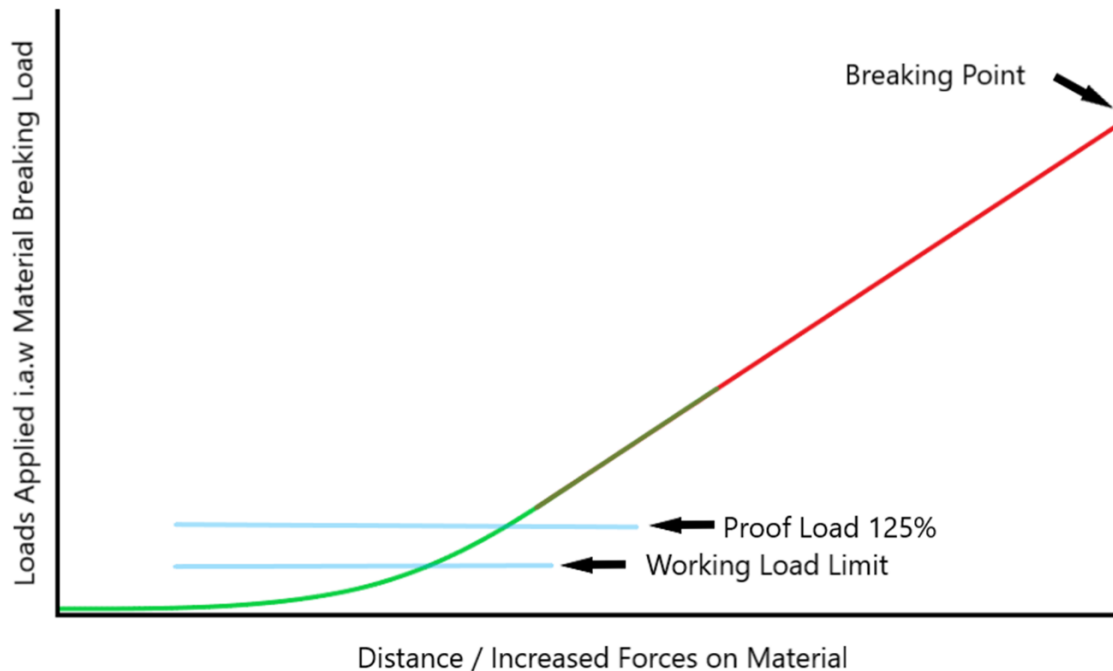
Note: The requirement in rule 133.307(a)(1) for visual inspection is the absolute minimum that is required. Ideally operators and staff should inspect all underslung load equipment pre-flight, during the working day and after last flight for condition when in use. They also need to check equipment to ensure it is good to use, despite how recently it has been through a proof load or other test. If any design exceedance is suspected due to the conduct of a flight, the equipment suspected is to be withdrawn from service until it is inspected or re-tested to establish that it is still serviceable.

Exceeding the WWL/SWL by 25% under controlled testing conditions is not detrimental to the equipment, as it remains well within the factor of safety built into by design and manufacture in accordance with ASME B30.12-2011 / B30.12-2014.

The rated strength referred to in rule 133.307(a)(2) is the same as WLL. The relationship between WLL and the annual (or 500 hour) test is illustrated below in Figure 3 and shows this test does not, in any way, compromise the integrity of the equipment by exceeding its ultimate strength (breaking point).

Appendix 5 also illustrates this point.

Figure 3 – How breaking point is reached over time



If it is not possible to show that external load equipment has been inspected and proof load tested to these standards, then this is not compliant with rule 133.307(a) and the equipment should be removed from service immediately.

Rule 133.307(b) – Maintaining external load equipment

This rule is an alternative to rule 133.307(a). If using this option, the operator should demonstrate that they have documented and are following, either:

- procedures in the manufacturer's maintenance manual or instructions for continued airworthiness, or
- procedures and instructions of a maintenance programme approved by the CAA under rules 91.607, or 119.63, or 119.111 as applicable to their operation.

Training recommendations

Part 133 does not prescribe training beyond pilot qualifications in rule 133.5, training in rappelling operations if needed, in rule 133.71, and for crew members to be competent in rule 133.75. However, operators who need to have an SMS should outline their training plans in their hazard and risk register, e.g. as controls to reduce risks.

Some recommended training options include, but are not limited to:

- dogman courses, for ground crew members, and
- operator-developed SOPs, and other internal training.

Safety management system (SMS) and risk management

Operators who are operating under Part 135 or 137 certificates must develop, document, implement, and maintain an SMS. This system should include internal audits and regular reviews of the system for safety management. AC100-1, *Safety Management*, provides comprehensive guidance material to help organisations implementing an SMS³.

As part of an SMS, operators need to apply a risk management methodology that enables them to adequately assess any risk to safety their operation may pose. This needs to record any hazards identified and outline how the associated risks will be mitigated or managed.

Risk management is a staged process:

- firstly, doing an initial hazard assessment for the intended operations, then,
- identifying any associated risks arising from those hazards, then

based on the risk assessment:

- developing and implementing controls, namely robust and achievable procedures for operational checks, training, maintenance and so on, including procedures for how operators and staff will manage their risk on an ongoing basis.

To do this, an operator needs to:

- assess risks to safety
- develop a plan to manage or mitigate risks to ensure they can operate safely
- develop procedures to carry out this plan
- describe their approach and the steps taken, and
- show that staff:
 - understand this approach and know how to run the risk management process
 - are adequately resourced to carry out this part of their jobs, and
 - are trained in risk management and their skills kept current.

³ In addition, AC00-3, *Internal Quality Assurance*, has general advice about quality management, that can be helpful in developing procedures for audits and regular checks.

Risk management is an ongoing process that is most effective when integrated through all levels of the operation and where risks and any lessons learnt are communicated to all staff, stakeholders and customers. When done well, this will improve awareness and understanding of the risks in the operating environment.

Helicopter external or underslung load operations present a unique range of threats and hazards arising from factors, such as:

- The need to configure and use specialised equipment, from modifications to aircraft, rigging and tools to contain loads being carried (nets, cages, flexible fadges, etc.)
- Equipment not being maintained correctly, leading to defences and failures
- Interactions between crew (pilot and loaders/riggers), customers, workers on the ground, emergency services, all with their own competency requirements
- Flying in remote areas in a variety of environments (forests, mountains, etc.)
- Unscheduled operations, sometimes last-minute or ad hoc, and/ or
- Infrequent and irregular activities that are not at the core of the operators' activities

These can all affect the performance and how safely operations are carried out. They are also often interrelated with each other, as outlined in Figure 1.

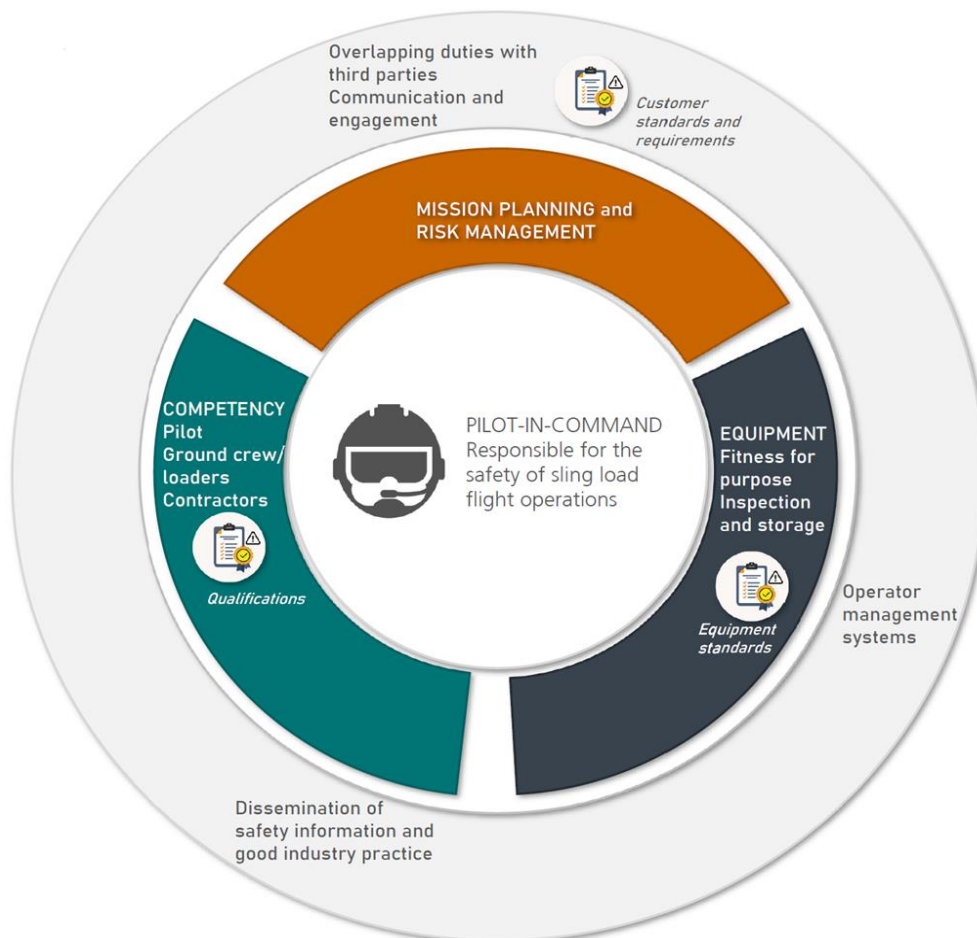


Figure 1 – The elements that can help or hinder successful external load operations

Operators also have obligations under the Health and Safety at Work Act (HSWA). While this AC does not cover those obligations, there are links in the *Further Resources* section, below.

Reporting incidents and accidents

In accordance with Part 12, *Accidents, Incidents, and Statistics*, details of all incidents must be submitted to CAA within 14 days of the incident. Informants must follow up an incident initially notified to CAA under rule 12.55 by submitting details to provide complete information about the incident.

Operators must establish procedures and systems to submit incident details and include them in the organisation's certification exposition.

CAA recommends systems in which a responsible person within the operation is nominated to:

- receive all information about incidents
- establish which information meets the criteria to be submitted to CAA
- correlate operational and technical aspects, and
- provide any relevant supplementary information.

There is more information about reporting incidents, what to include and why this is so important to aviation safety, in the Part 12 ACs, listed below.

Further resources

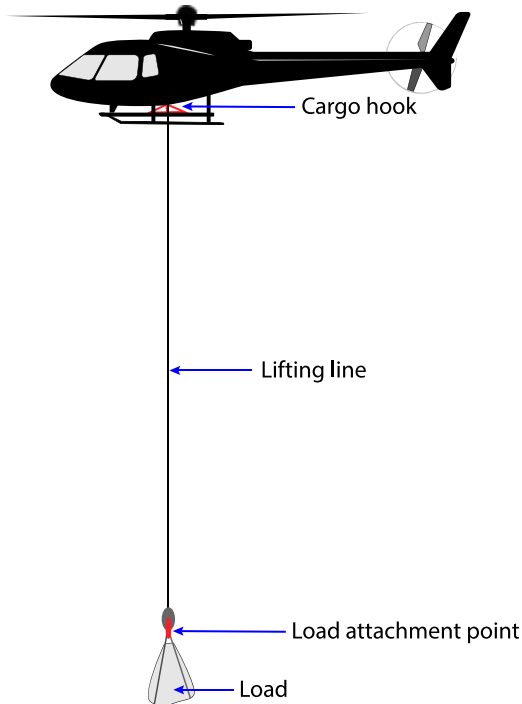
- <https://www.aviation.govt.nz/safety/safety-advice/transporting-dangerous-goods/>
- [Inspections and safe use of lifting equipment - March 2022](#)
- <https://aviation.govt.nz/safety/safety-advice/helicopter-safety/helicopter-resources/>
- [AC00-3, Internal Quality Assurance](#)
- [AC100-1, Safety Management](#)
- CAA's [SMS pages](#), including the four SMS Resource kit booklets.
- [AC12-1, Mandatory occurrence notification and information](#)
- [AC12-2, Occurrence investigation](#)
- [AC92-1, Dangerous Goods Training](#)
- [AC92-2, Carriage of Dangerous Goods](#)
- [AC92-3, Dangerous Goods Packaging approval](#)
- [AC92-4, Dangerous Goods Manuals](#)

- MBIE's ACOP for Load Lifting, which can be found on the WorkSafe NZ website at: <https://www.worksafe.govt.nz/topic-and-industry/load-lifting-and-rigging/>
- [ASME B30.12-2011 \(Handling Loads Suspended From Rotorcraft\)](#)
- [ASME B30.19-2014 \(Slings – Safety Standard for Cableways, Cranes, Derricks, Hoists, Jacks, and Slings\)](#)
- <https://www.standards.govt.nz/shop/iso-310002018/> (not available for free)
- [ISO 31000, Risk management](#)
- [ISO 31000:2018, Risk management — Guidelines](#) (not available for free)
- [ISO 31000:2018 Risk management – Principles and Guidelines](#)
- <https://www.worksafe.govt.nz/laws-and-regulations/acts/hswa/>
- <https://www.worksafe.govt.nz/managing-health-and-safety/managing-risks/how-to-manage-work-risks/>
- <https://www.worksafe.govt.nz/assets/dmsassets/zero/401WKS-1-building-and-construction-ACOP-load-lifting-rigging.pdf>
- <https://www.worksafe.govt.nz/topic-and-industry/cranes/crane-safety-construction-managers-supervisors-fs/>

Appendix 1 – Checklists

Typical external load equipment and terminology

Figure 2 – Helicopter and external load



Note 1: The cargo hook usually remains attached to the helicopter between external load operations.

Note 2: Other equipment such as slings, spreaders, harnesses, strops, or other lifting may be used in place of 'lifting line'. This guidance applies equally regardless of configuration.

Common areas of failure

Equipment issues

Equipment malfunctioning, whether because of an inherent defect, or because it has not been properly stored and maintained, is a common theme in many reports CAA receives on helicopter external load occurrences. Data from occurrence reports shows the leading problems are:

- cargo hook failure or defect
- release cable failure or defect
- inadvertent hook release
- strop/load rotor or ground contact, and
- the strop being hooked on skid.

Some of the reasons are technical, due to equipment defects:

- hook assembly damage from operational wear, allied with inadequate maintenance
- incorrect installation/rigging of release cables, e.g. to prevent them being incorrectly routed, becoming 'tight' and inadvertently triggering the manual/emergency release function
- use of short strops
- flying empty or very lightly loaded strops
- inadequate load/terrain clearance
- inflight load failure leading to empty strops making rotor contact, and
- torsional stress from buckets.

Human and organisational system issues

While inappropriate or worn equipment accounts for some failures, however, other instances can be attributed to issues in planning, staff competency, and running operations, such as:

- inadequate rigging training and knowledge from ground crew (particularly third-party crews)
- lack of refresher training, or plans for refresher training to ensure that staff knowledge and expertise is kept current
- inadequate planning and briefing or coordination between parties
- a lack of risk assessment or consideration of hazards specific to a job, including how the load will behave (controllability) under aerodynamic conditions whilst in flight.

SMS provides a useful framework for robust planning and risk management for these types of operations, but as with an effective SMS, managing the risks inherent in helicopter external load operations is an ongoing and dynamic job. Risks and the operational environment change, different types of loads are carried, and equipment gets worn with use.

Questions about management of external load equipment

CAA inspectors will typically ask the following questions when assessing an operator's methods of control and ensuring systems are effective for external load equipment.

Storage and identification

- How does the operator store and label the equipment?
- Does this ensure loading crew know that they are using equipment that is compliant, has been checked, and is strong enough for the load and operation they are undertaking?
- How does the operator deal with equipment that is no longer to the appropriate standard, including:
 - methods of discarding non-compliant equipment, and

- mechanisms to assess equipment failures and ensure they don't happen again.
- What records does the operator maintain:
 - records of purchase or manufacture
 - maintenance records
 - results of inspections and tests, and
 - records of worker competence and on-going training to maintain, inspect, and use external load equipment.
- How are records stored and kept secure?




Relationship with suppliers of external load equipment and services

- How does the operator use their safety and risk management processes to remain satisfied that their suppliers are providing external load equipment that is designed or manufactured, and maintained or inspected to the required standards?
- How is unsatisfactory supplier performance managed?




Appendix 2 – Examples of documentation

Example: Cargo Hook Kit for MDHI helicopters 369- and 500 Series FAA STC SR01778SE

Excerpt from FAA-issued Rotorcraft Flight Manual Supplement

<div style="border: 1px solid black; padding: 5px; transform: rotate(-5deg); display: inline-block;"> PLEASE CHECK WEB SITE AT WWW.ONBOARDSYSTEMS.COM FOR THE LATEST REVISION OF THIS MANUAL </div> <p style="text-align: center;">FAA APPROVED ROTORCRAFT FLIGHT MANUAL SUPPLEMENT STC SR01778SE Cargo Hook Kit With Talon LC Hydraulic Cargo Hook</p> <p style="text-align: center;">MDHI Models 369D, 369E, 369F, 369FF, 369HE, 369HM, 369HS, 500N</p> <p>R/N _____ S/N _____</p> <p>FAA Approved:  <small>For Manager, Northwest Flight Test Section, AIR-715 Federal Aviation Administration Seattle, WA</small></p> <p>Date: <u>10 Jan 2020</u></p>	<p style="text-align: center;">PART IV NORMAL PROCEDURES</p> <p>Pre-Flight Check Before a flight involving external load operations perform the following procedures. If the procedures are not successful do not use the equipment until the problem has been corrected.</p> <ol style="list-style-type: none"> 1. Check all mounting fasteners to ensure they are tight. 2. Check cargo hook attach point and other structural components related to the cargo hook for signs of cracks and damage. 3. Check the electrical connectors for security and damage. 4. Check the slave cylinder on the cargo hook for signs of hydraulic fluid leakage. 5. Swing the cargo hook assembly to its full travel extremes to verify that it does not reach the range of motion limits of the electrical harnesses and hydraulic hose. <div style="background-color: #f4a460; padding: 20px; text-align: center; margin-top: 20px;"> FOR ILLUSTRATION PURPOSES ONLY </div>										
 <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>RFM Supplement</td> <td>Document Number 121-028-01</td> </tr> <tr> <td>Cargo Hook Kit</td> <td>Page 1 of 23 Revision 3</td> </tr> </table>	RFM Supplement	Document Number 121-028-01	Cargo Hook Kit	Page 1 of 23 Revision 3	 <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>RFM Supplement</td> <td>Document Number 121-028-01</td> <td>Revision 3</td> </tr> <tr> <td>Cargo Hook Kit</td> <td>Page 10 of 23</td> <td>FAA Approved <u>10 Jan 2020</u></td> </tr> </table>	RFM Supplement	Document Number 121-028-01	Revision 3	Cargo Hook Kit	Page 10 of 23	FAA Approved <u>10 Jan 2020</u>
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Cargo Hook Kit	Page 1 of 23 Revision 3										
RFM Supplement	Document Number 121-028-01	Revision 3									
Cargo Hook Kit	Page 10 of 23	FAA Approved <u>10 Jan 2020</u>									

Excerpts from Original Equipment Manufacturer (OEM) owner's manual 120-207-00

<div style="border: 1px solid black; padding: 5px; transform: rotate(-5deg); display: inline-block;"> PLEASE CHECK WEB SITE AT WWW.ONBOARDSYSTEMS.COM FOR THE LATEST REVISION OF THIS MANUAL </div> <p style="text-align: center;">Cargo Hook Kits <small>For The</small> MD Helicopters 369 Series and 500N</p> <p style="text-align: center;">STC SR01778SE</p> <p style="text-align: center;">System Part Numbers 200-378-XX 200-379-XX</p> <p style="text-align: center;">Owner's Manual <small>Owner's Manual Number 120-207-00 Revision 7 August 8, 2023</small></p> <p style="text-align: center;"></p> <p style="text-align: center; font-size: small;">13915 NW 3rd Court Vancouver Washington 98685 USA Phone: 360-546-3072 Fax: 360-546-3073 Toll Free: 800-275-0883 www.OnboardSystems.com</p>	<p style="text-align: center;">PART IV NORMAL PROCEDURES</p> <p>Pre-Flight Check Before a flight involving external load operations perform the following procedures. If the procedures are not successful do not use the equipment until the problem has been corrected.</p> <ol style="list-style-type: none"> 1. Check all mounting fasteners to ensure they are tight. 2. Check cargo hook attach point and other structural components related to the cargo hook for signs of cracks and damage. 3. Check the electrical connectors for security and damage. 4. Check the slave cylinder on the cargo hook for signs of hydraulic fluid leakage. 5. Swing the cargo hook assembly to its full travel extremes to verify that it does not reach the range of motion limits of the electrical harnesses and hydraulic hose. 										
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Cargo Hook Kit	Page 10 of 23 Revision 3										
RFM Supplement	Document Number 121-028-01	Revision 3									
Cargo Hook Kit	Page 10 of 23	FAA Approved <u>10 Jan 2020</u>									

Excerpt from OEM ICA 123-021-01

Instructions for Continued Airworthiness
123-021-01

Section 5 Inspection and Overhaul Schedule

5.1 Cargo Hook Kit Inspection

The scheduled inspection intervals noted below are maximums and are not to be exceeded. If the cargo hook is subjected to unusual circumstances, extreme environmental conditions, etc., it is the responsibility of the operator to perform the inspections more frequently to ensure proper operation.

Annually or 100 hours of external load operations (see section 5.2 for definition), whichever comes first, inspect the cargo hook kit per the following. Refer also to the cargo hook's Component Maintenance Manual (manual no. 122-015-00) for additional inspection.

1. Activate the electrical system and press the Cargo Release button on the cyclic to ensure the cargo hook electrical release system is operating correctly. The cargo hook must release. Reset the hook by hand after release.

CAUTION

Depressing the cargo release button continuously in excess of 20 seconds will cause the cargo hook solenoid to overheat, possibly causing permanent damage.

The following instructions are applicable to cargo hook P/N 528-028-02 which is equipped with Surefire electrical release. With no load on the cargo hook perform the following.

- *Very* briefly press the Cargo Release switch, the cargo hook should not actuate and the load beam should remain closed.
 - Press and hold the Cargo Release switch for a few seconds, the load beam should fall to the open position and the cargo hook solenoid should continue to cycle repeatedly.
 - Push up on the load beam and verify that it latches and the hook lock indicator is aligned with the engraved line on the manual release cover.
2. Activate the hydraulic release system by pulling the release lever on the cyclic. The lever should operate smoothly and the cargo hook must release. Return the load beam to its closed and locked position by hand after release. Verify that the hook lock indicator on the side of the hook returns to the fully locked position. In the fully locked position the hook lock indicator must align with the lines on the cover (see Figure 5.1.1).

FOR ILLUSTRATION
PURPOSES ONLY

Appendix 3 – Example of CAA-issued supplemental type certificate and CAA-approved flight manual supplement

Example BK117 dual hook system for external cargo CAA STC No. 21/21E/7

CAA-issued Supplemental Type Certificate



CAA
CIVIL AVIATION AUTHORITY
OF NEW ZEALAND
Te Mana Rererangi Tamatanui o Aotearoa

SUPPLEMENTAL TYPE CERTIFICATE
No. 21/21E/7

This certificate is issued to;
Operator NZ

and certifies that the change in the type design identified below with the limitations and conditions specified meets the New Zealand supplemental type certification requirements stated in Civil Aviation Rule Part 21 Subpart E.

Product model: **KHI BK117 A3, A4, B-1, B-2, C-1**
Applicable type certificate: **JCAB TC No. 32**

Certification Basis: **FAR Part 29 including up to amendment number 29-16.**
Description of type design change: **Installation of BK117 Dual Hook System for External Cargo in accordance with CAA approved Master Document List AW1528 MDL Revision 0 dated 17 August 2022, or later CAA approved revision.**
Limitations: **Aircraft with this STC embodied must be operated in accordance with the CAA approved Flight Manual Supplement AW1528 FMS at Revision 0 dated 08 July 2022 and maintained in accordance with the Instructions for Continued Airworthiness AW1528 ICA at Revision 0 dated 01 July 2022, or later CAA approved revisions.**

Issued this 05th day of September 2022


for Director of Civil Aviation

Conditions: This certificate is only applicable to the type/model specified herein. Prior to incorporating this design change, it shall be established that the interrelationship between this change and any other design change(s) incorporated will not adversely affect the airworthiness of the modified type/model.

FOR ILLUSTRATION PURPOSES ONLY

Excerpts from Flight Manual Supplement

	Document Number:	AW1528 FMS	Revision:	R0
	Document:	FLIGHT MANUAL SUPPLEMENT		
	Design Change Title:	BK117 DUAL HOOK		
	Prepared by:	Date: 2022-07-01	Checked by:	Date: 2022-07-01

Sections 2 through 5 of this document comprise the approved Rotorcraft Flight Manual Supplement. Compliance with section 2, Limitations, is mandatory. Sections 1, 6, 7 and 8 are unapproved and are provided for information only.

This supplement is applicable to BK117 rotorcraft modified in accordance with Airwork (NZ) Limited design change AW1528.

The information contained herein supplements or supersedes the basic manual only in those areas described. For limitations, procedures, performance and loading information not contained in this supplement, consult the basic rotorcraft flight manual.

SERIAL NO:

REGISTRATION:

APPROVAL:

DATE:

**FOR ILLUSTRATION
PURPOSES ONLY**

Document Number:	AW1528 FMS	Revision:	R0
Document:	FLIGHT MANUAL SUPPLEMENT		
Design Change Title:	BK117 DUAL HOOK		
Prepared by:	Date: 2022-07-01	Checked by:	Date: 2022-07-01

SECTION 4. NORMAL PROCEDURES

CAUTION: To assist monitoring the load during load pick-up, release, or enroute flight it is recommended to use one of the following:

- Cargo hook mirror assembly.
- Crew member to assist with load observation.

CAUTION: Compatibility with equipment such as fixed landing lights and/or the Search and Landing Light (right side installation) must be operationally demonstrated if used during night operations prior to use.

NOTE: To conduct the following checks have ground crew assist the pilot.

4.1 Pre-flight check

If pre-flight check is unsuccessful do not use cargo hooks prior to problem correction.

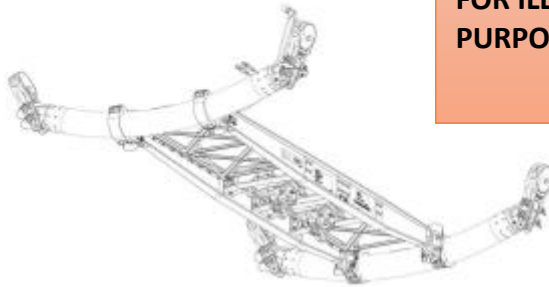
4.1.1 Exterior check

1. Check all mounting fasteners to ensure that they are secure and dual locking systems are in place.
2. Check cargo hook and support structure for damage, corrosion, wear and cracks.
3. Check the electrical bonding straps, harness, and its connection on the cargo hook for security and damage.
4. Check free and proper movement of hooks throughout full range of hook travel ensuring no restriction with surrounding structure, electrical harness or hydraulic hoses.
5. Check the hydraulic hoses and quick disconnect for signs of fluid leakage.
6. Check Hook 1 and Hook 2 travel stop bumpers for condition and security (see Sec 8.4)
7. Check all four crosstube attachment link bumpers for condition and security (see Sec 8.5)

**FOR ILLUSTRATION
PURPOSES ONLY**

Excerpts from ICA

Document Number:	AW1528 ICA	Revision:	R0
Document:	INSTRUCTIONS FOR CONTINUED AIRWORTHINESS		
Design Change Title:	BK117 DUAL HOOK INSTALLATION		
Prepared by:	Date: 2022-08-12	Checked by:	Date: 2022-08-12



FOR ILLUSTRATION PURPOSES ONLY

Document Number:	AW1528 ICA	Revision:	R0
Document:	INSTRUCTIONS FOR CONTINUED AIRWORTHINESS		
Design Change Title:	BK117 DUAL HOOK INSTALLATION		
Prepared by:	Date: 2022-08-12	Checked by:	Date: 2022-08-12

2. INSPECTION AND SERVICING REQUIREMENTS

2.1. Inspection Schedule

Refer to drawings Ref /G/ thru /N/ for component identification and location

NOTE: Calendar maintenance intervals must be complied with regardless of operating time with AW1528 removable provisions installed.

Observe all OEM SB's and ICA requirements for non (operator) parts.

Refer §2 Airworthiness Limitations for additional inspection / retirement requirements.

Table 3-1 Inspection Schedule

Inspection Item	Refer to Parashoot or Document	Drawing / Part Number	Periodic Inspections ^a				Engineer
			150 hr ^b	600 hr ^b	1,000 hr	Calendar Time	
Fixed Provisions, General	4.2.5 4.2.6 4.2.7 4.2.8	AW1528-29-01 AW1528-31-01 AW1528-40-01 AW1528-41-01	X			12 months ^c	
Fixed Provisions, Detailed	4.2.10 4.2.13	AW1528-37-01 AW1528-40-01 AW1528-41-01		X		2 years ^c	
Load Cell (if installed)	4.2.12	AW1528-38-01	X			12 months ^c	
Removable Provisions, General	4.2.2 4.2.3 4.2.4	AW1528-00	X ^d			12 months ^c	
Removable Provisions, Detailed	4.2.9 4.2.11	AW1528-50 AW1528-53-01 AW1528-53-02		X ^d		2 years ^c	
Cargo Hooks, Inspection	Ref /N/	P/N: 528-028-00	Refer Onboard Systems CMM (Ref /N/) for inspection requirements				
Cargo Hooks, Overhaul	Ref /N/	P/N: 528-028-00			X ^d	5 years	
Load Cell, Inspection & Calibration (if installed)	Return to Onboard Systems	P/N: 210-301-01			X ^d	5 years	

Notes:

- (i) The periodic inspections are to be performed according to the flight hours or calendar time, depending on which limit is reached first.
- (ii) Inspection interval tolerance is permitted per airframe OEM Maintenance Manual (Ref /B/ or /E/ as applicable).
- (iii) Flight hours relating to removable provisions are defined as flight time with the removable provisions installed on the aircraft and load attached to either hook (whether or not a useful load is being transported).
- (iv) Flight hours relating to Onboard Systems components are defined per Ref /N/.

Appendix 4 – Worked example

External Load

To carry a 400kg load using a fabric sling, based on ASME B30.9-2104, the fabric sling must be designed with a factor of safety of 6. This requires webbing with a minimum breaking strength of $6 \times 400 = 2,400\text{kg}$.

Selecting webbing with 2,500kg breaking strength (or above) and constructing a sling in accordance with ASME (figure xxx) produces a sling with a safe working load (SWL) of $2,500 / 6 = 416\text{kg}$. **This would be sufficient for any load up to 416kg. Practically this sling could be marked with a SWL = 400kg.**

Human load

External carriage of a 90 kg person with 10 Kg of clothing and equipment would require external load equipment with a SWL = $3.75 \times (\text{weight of person} + \text{equipment})$

$$\begin{aligned}\text{SWL} &= 3.75 \times (90 + 10) \\ &= 3.75 \times 100 \\ &= 375\text{kg}\end{aligned}$$

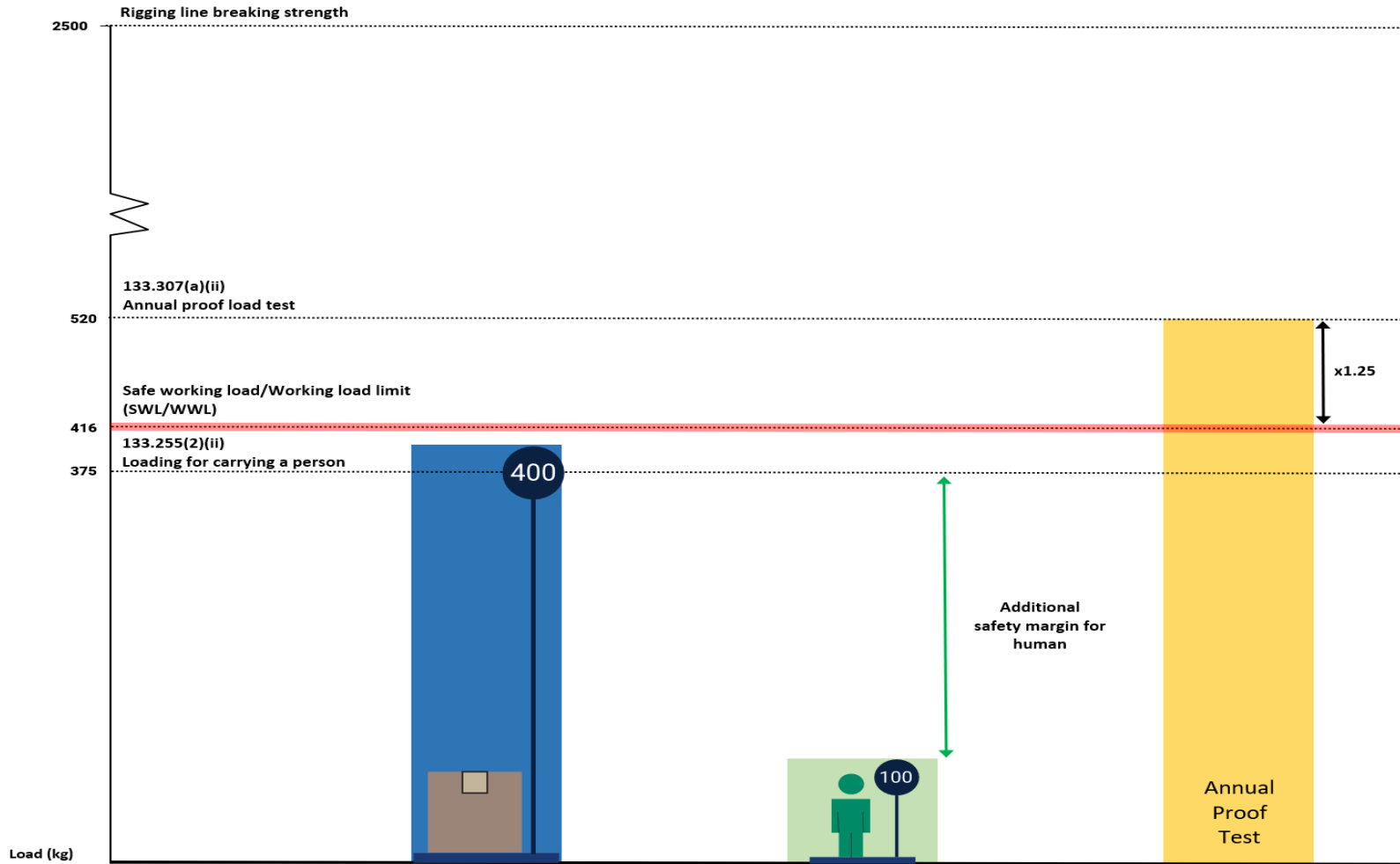
The previously mentioned sling with a SWL of 416 Kg would thus be acceptable for the external carriage of a person ($416 > 375$).

The human load rule **133.255(2)(ii)** ensures that equipment used for carrying persons are operating at loads well below its normal SWL. This extra margin for human loads as compared to freight recognises the safety of life aspect.

$$\begin{array}{rcl}\text{SWL} - \text{Actual load} & = & \text{Safety margin} \\ 400 - 100\text{kg} & = & 300\text{kg}\end{array}$$

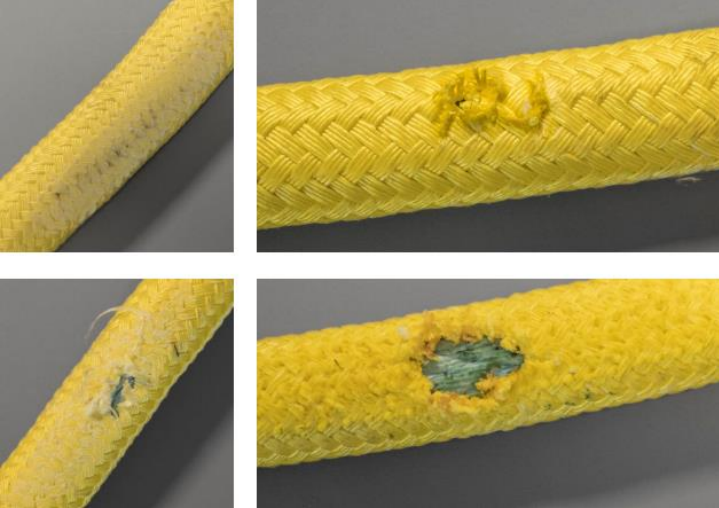
$$375 - 100 = 265\text{kg}$$



Appendix 5 – Representation of loads applied to the fabric sling


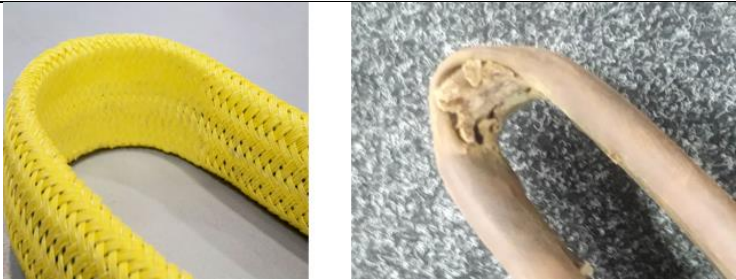





Appendix 6 – Examples of damage




Equipment showing any of this damage should be removed from service.



Item - issue	Example
Casing wear	 The 'Example' column contains four photographs of a yellow braided rope. The top-left photo shows a close-up of the rope's texture. The top-right photo shows a frayed section where the braiding is broken. The bottom-left photo shows a small hole with some fraying. The bottom-right photo shows a larger, irregular hole where the rope's core is exposed.


Item - issue	Example
<p>Chemical or heat damage</p>	
<p>Cuts and abrasions</p>	





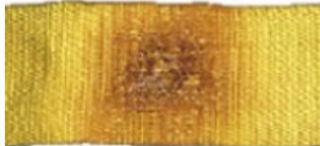

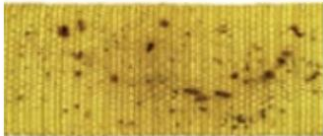


Item - issue	Example
<p>Illegible ID tag</p>	
<p>Load bearing wear at contact points</p>	
<p>Mechanical damage</p>	




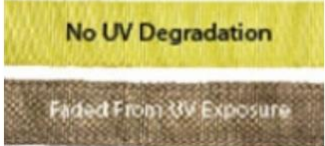


Item - issue	Example
Substandard termination	
Common forms of damage on flat webbing	
Bird cage	

Item - issue	Example
Broken wire	
Corrosion	
Dog legs and kinks	

Item - issue	Example
Severely stretched chain	
Surface damage	

Item - issue	Example
Worn and damaged hooks	 <p>The 'Example' column contains six photographs of hooks in various states of wear and damage. The top row shows two hooks: the left one is heavily corroded with yellow and black patches, and the right one is bent and deformed. The middle row shows two hooks: the left one is heavily corroded and has a jagged end, and the right one is bent and has a small loop at the top. The bottom row shows two hooks: the left one is bent and has a jagged end, and the right one is bent and has a small loop at the top.</p>

Item - issue	Example		
Miscellaneous damage			
			
	<p>Burn Marks</p>	<p>Cuts</p>	<p>General Wear</p>
			
	<p>Edge Cuts</p>	<p>Burn Marks</p>	<p>Snags</p>
			
	<p>Welding Splatter</p>	<p>Damaged Stitching</p>	<p>Eye Damage</p>

Item - issue	Example
	 <p data-bbox="607 533 748 564">Fragments</p>  <p data-bbox="1028 533 1160 564">Cut Edges</p>  <p data-bbox="1400 533 1581 564">Illegible Label</p>  <p data-bbox="571 791 784 823">UV Degradation</p>  <p data-bbox="1034 791 1113 823">Knots</p>  <p data-bbox="1435 791 1581 823">Edge Nicks</p>