

Ref:	NR/L3/OPS/251
Issue:	4
Date:	04 September 2021
Compliance date:	04 September 2021

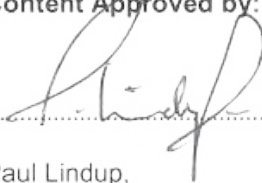
## Level 3

### Work Instruction

# Unmanned aircraft system (DRONE/UAS) Operations

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## User information

This Network Rail document contains colour-coding according to the following Red–Amber–Green classification.

### **Red requirements – no variations permitted**

- Red requirements are to be complied with and achieved at all times.
- Red requirements are presented in a red box.
- Red requirements are monitored for compliance.
- Non-compliances will be investigated and corrective actions enforced.

### **Amber requirements – variations permitted subject to approved risk analysis and mitigation**

- Amber requirements are to be complied with unless an approved variation is in place.
- Amber requirements are presented with an amber sidebar.
- Amber requirements are monitored for compliance.
- Variations can only be approved through the national variations process.
- Non-approved variations will be investigated and corrective actions enforced.

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- Guidance should be followed unless an alternative solution produces a better result.
- Guidance is presented with a dotted green sidebar.
- Guidance is not monitored for compliance.
- Alternative solutions should be documented to demonstrate effective control.

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Where it is considered not reasonably practicable<sup>1</sup> to comply with the requirements in this standard/control document, permission to comply with a specified alternative should be sought in accordance with the Network Rail standards and controls process, or with the Railway Group Standards Code if applicable.

If this standard/control document contains requirements that are designed to demonstrate compliance with legislation they shall be complied with irrespective of a project's Governance for Railway Investment Projects (GRIP) stage or Project Acceleration in a Controlled Environment (PACE) phase. In all other circumstances, projects that have formally completed GRIP Stage 3 (Option Selection) or PACE strategic development and project selection phase may continue to comply with any relevant Network Rail standards/control documents that were current when GRIP Stage 3 or PACE phase 1 was completed.

**NOTE 1:** Legislation includes National Technical Specification Notices (NTSNs).

**NOTE 2:** The relationship of this standard/control document with legislation and/or external standards is described in the purpose of this standard.

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**Issue record**

<b>Issue</b>	<b>Date</b>	<b>Comments</b>
1	December 2016	First Edition.
2	March 2019	Out of date information removed. Safety procedures added. Level 2 module now Level 3 standard.
3	September 2019	Sections 6 and 7 have been updated with regards changes in flight restrictions and the permissions process.
4	September 2021	Incorporate emergency change NR/BS/LI/462 concerning a) legislative changes that came into force on 1 January 2021 and b) to set out the permissions for flights at night. Minor revisions to reflect changes to commercial drone operations.

**Reference documentation**

Civil Aviation Authority (CAA) Guidance Publication CAP 722

Air Navigation Order (ANO)

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## 1 Purpose

This work instruction sets out:

- a) the operating arrangements for the preparation and execution of Unmanned Aircraft System (UAS/drones) flights near, on or over Network Rail infrastructure by:
  - 1) an approved Network Rail in-house drone operator;
  - 2) a commercial drone operator contracted by Network Rail (including those employed by a framework company or principle/tier 1 contractor); and
  - 3) commercial drone operators acting on behalf of lineside neighbours.
  
- b) the need for drone operators to mitigate against the risk of:
  - 1) damage to overhead lines, electrical wires or signalling systems;
  - 2) distractions to track staff or train drivers; and
  - 3) UAS system failure resulting in injury or derailment.

This document provides a process for compliance with the:

- a) Air Navigation Order (ANO); and
- b) Civil Aviation Authority (CAA) Guidance Publication CAP 722.;

## 2 Scope

This work instruction applies to any person who needs to operate UAS/drones near, on or over Network Rail infrastructure and details:

- a) competency for drone operators;
- b) equipment permitted to be used;
- c) proximity to Network Rail Infrastructure;
- d) flight notification arrangements; and
- e) accident reporting.

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### 3 Definitions

For the purpose of this document, the following terms and definitions apply.

<b>Air Navigation Order (ANO)</b>	The legal foundation for most areas of civil aviation that are regulated at a national level, including UAS/drones.
<b>Beyond Visual Line of Sight (BVLOS)</b>	Anything which is at or beyond the distance at which it can be seen by a drone operator without additional visual aided equipment.
<b>British Transport Police (BTP)</b>	A national special police force that polices railways and light-rail systems in England, Wales and Scotland.
<b>CAP 722</b>	Guidance published by the CAA which is intended to assist those who are involved in all aspects of drone operations.
<b>Congested Area</b>	An area which is substantially used for residential, commercial, industrial or recreational purposes. <b>NOTE 1:</b> It is defined in relation to a city, town or settlement. Specific permission(s) from the CAA needs to be obtained to operate in a congested area.
<b>Extended Visual Line of Sight (EVLOS)</b>	The ability to fly further than the standard 500 metres from the UAS/drone Operator by using observers along the flight distance.
<b>Framework Agreement for Unmanned Aircraft Systems</b>	Approved suppliers within the Network Rail supply chain who are contracted to provide services detailed within the agreement. <b>NOTE 2:</b> For a list of current approved suppliers, contact Network Rail Air Operations.
<b>Flight Management System (FMS)</b>	Network Rail's online system that allows UAS/drone operators to submit a flight notification for approval by Air Operations.
<b>Mandatory Occurrence Reporting (MOR)</b>	Scheme governed by European Regulations.
<b>Maximum Take-off Mass (MTOM)</b>	Maximum weight of aircraft at which the operator is allowed to take off. <b>NOTE 3:</b> The limits are imposed due to structure or other reasons.
<b>Near, on or over Network Rail infrastructure</b>	Operating from, or closer than 50 metres or over any height to Network Rail infrastructure

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<b>Network Rail Infrastructure</b>	<p>Infrastructure and land owned by Network Rail.</p> <p><b>NOTE 4:</b> <i>The land might be leased to, or under the control, of, another party.</i></p>
<b>National Qualified Entity (NQE)</b>	<p>A CAA approved training provider that trains basic Drone / SUA Operators. At the end of the course a successful candidate will be a certified Drone / SUA Operator.</p>
<b>Operations Manual (as defined in CAP 722)</b>	<p>Document produced by the operator relating to operation of the drone and related equipment.</p> <p><b>NOTE 5:</b> <i>It might be leased to, or under the control, of, another party and is defined in <a href="#">CAP 772</a>.</i></p>
<b>Operational Safety Case (OSC)</b>	<p>Approval granted by the CAA which allows UAS/drone operators to operate closer than standard permissions.</p> <p><b>NOTE 6:</b> <i>Drones of 7kg or less are not required to use the OSC for standard permission (this implies keeping at least 50 metres clear of third parties etc).</i></p>
<b>Permission</b>	<p>An approval granted by the CAA upon successful submission of an Operations Manual, known as a Permission for Commercial Operations / Operational Authorisation (PfCO / OA).</p>
<b>Pre-Determined Risk Assessment (PDRA)</b>	<p>An approach to flying outside of the standard permissions utilising Category A1-A3 aircraft under the new regulations.</p>
<b>Rail Accident Investigation Branch (RAIB)</b>	<p>The independent body for investigating accidents and incidents on mainline railways, metros, tramways and heritage railways throughout the UK.</p>
<b>Recognised Assessment Entity (RAE)</b>	<p>A CAA approved training provider that trains basic Drone / SUA Operators. At the end of the course a successful candidate is a certified Drone / SUA Operator.</p>
<b>Unmanned Aircraft System (UAS) / Drone</b>	<p>Aircraft (or aircraft system) that is flown from a remote location without a pilot located in the aircraft itself.</p> <p><b>NOTE 7:</b> <i>CAA further defines this as ‘Small unmanned aircraft’ which means any unmanned aircraft, other than a balloon or a kite, having a mass of not more than 20kg without its fuel but including any articles or equipment installed in or attached to the aircraft at the commencement of its flight.</i></p>



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<b>Unmanned/Unified Traffic Management system (UTM)</b>	<p>Automated system that allows for de-confliction between manned and unmanned aircraft systems.</p> <p><b>NOTE 8:</b> <i>This is similar to the ATM that NATS utilise on a daily basis for Air Traffic Control.</i></p>
<b>Visual Line of Sight (VLOS)</b>	<p>Maximum distance at which the UAS/drone operator is able to maintain separation and collision avoidance, under the prevailing atmospheric conditions, with the unaided eye (other than corrective lenses).</p> <p><b>NOTE 9:</b> <i>Within the UK, VLOS operations are normally have a maximum distance of 500 metres horizontally and 400 feet vertically, from the operator. The parameters are maximum and entirely dependent on visibility and weather conditions at the time.</i></p>

**Table 1 – Terms and definitions**

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## 4 Minimum operating requirements for individual / organisations

### 4.1 Network Rail in house UAS/drone operations

Prior to a Network Rail UAS/drone operator operating a UAS/drone near, on or over Network Rail infrastructure, they shall:

- a) hold an active qualification from a National Qualified Entity (NQE) or Recognised Assessment Entity (RAE) to a minimum of General Visual line of Sight Certificate (GVC) /PfCO; and
- b) have passed a Network Rail Air Operations internal flight assessment within twelve months of achieving their NQE/RAE qualification.

In preparing for and undertaking any flight, the UAS/drone operator shall:

- a) only fly a SUA/Drone that has been approved, registered and insured for use by Air Operations;
- b) conduct an Air Operations authorised risk assessment / method statement / safe system of work;
- c) notify Air Operations of the planned flight via the notification procedure described in section 7; and
- d) operate under the CAA's PfCO/Operational Authorisation, as granted to Network Rail Air Operations.

### 4.2 Framework and external UAS drone operations

Prior to an external commercial UAS/drone operator operating a UAS/drone near, on or over Network Rail infrastructure they shall:

- a) notify Air Operations of the planned flight via the notification procedure;

**NOTE 1:** see clause 7.

- b) conduct an authorised risk assessment / method statement / safe system of work.

This includes but is not limited to:

- 1. boundary ownership;
  - 2. track worker distraction;
  - 3. moving trains / line speeds;
  - 4. electrification and lineside hazards (overhead line equipment, conductor rails) and electrical overhead powerlines;
  - 5. localised Radio Frequency from GSM-R and Signal systems.
- c) document a robust and agreed system of alerting the relevant Network Rail Route Control Manager (RCM) of an incident involving the UAS/drone if it causes a safety concern to the running of the railway;

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**NOTE 2:** The RCM telephone number is provided when the FMS is used. An incident in this section is when damage is caused to the environment that could cause further damage or injury to the running rail.

- d) have Public Liability Insurance in force with a minimum value of £5 million for drone operations on or near the railway.

**NOTE 3:** Often referred to by Insurers as “Railway Work”. Flights conducted by Network Rail in-house UAS/drone operators should automatically be covered by Consequential Loss Insurance, however flights for Tier 1, Principle Contractors or Lineside companies should hold their own Consequential Loss Insurance.

- e) operate under a current [CAA] Permission supported by an approved Operations Manual; and
- f) comply with the Network Rail’s Life Saving Rules.

## 5 Minimum equipment requirements

Any UAS/drone operated near Network Rail infrastructure shall meet the following minimum technology requirements:

- a) ‘return to home’ capability;

**NOTE 1:** such that system failures should always result in the drone returning to a safe landing zone away from track.

- b) system technology that complies with their organisation’s CAA permission(s) and approved operations manual;
- c) the Maximum Take-Off Mass (MTOM) including fuel shall not exceed 7.35kg unless pre-agreed with Network Rail Air Operations. Agreements shall be signed off in the task specific risk assessment no later than 20 working days prior to the proposed flight date over the above weight limit. An authorised risk assessment shall be signed off by the client; and

If the UAS/drone operator has a requirement to expose the track to a greater element of risk then a direct consultation shall be carried out with Network Rail Air Operations at least 10 working days prior to the flight itself.

**NOTE 2:** Greater risk includes hovering over, multiple passes, flying down the centre line of the track or distances needing to be closer than stated below,

**NOTE 3:** Mitigation that should facilitate a smooth process should be aircraft with multiple redundancies, lightweight, fixed wing operating at height, all needing to be below the stated safe weight above.

## 6 Proximity to Network Rail infrastructure

### 6.1 Proximity permissions

All UAS/drone operators shall, as appropriate, abide by the proximity permissions defined in 6.1 to 6.3.

Following approval obtained via the flight notification procedure, Network Rail in-house UAS/drone operators and commercial UAS/drone operators deployed by a

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framework company may be permitted to fly over or closer than 50m to Network Rail infrastructure below the stated safe weight.

All other commercial UAS/drone operators seeking to fly closer than 50 metres to the infrastructure shall provide valid insurance documentation, evidence of a risk assessment and have obtained approval via the flight notification.

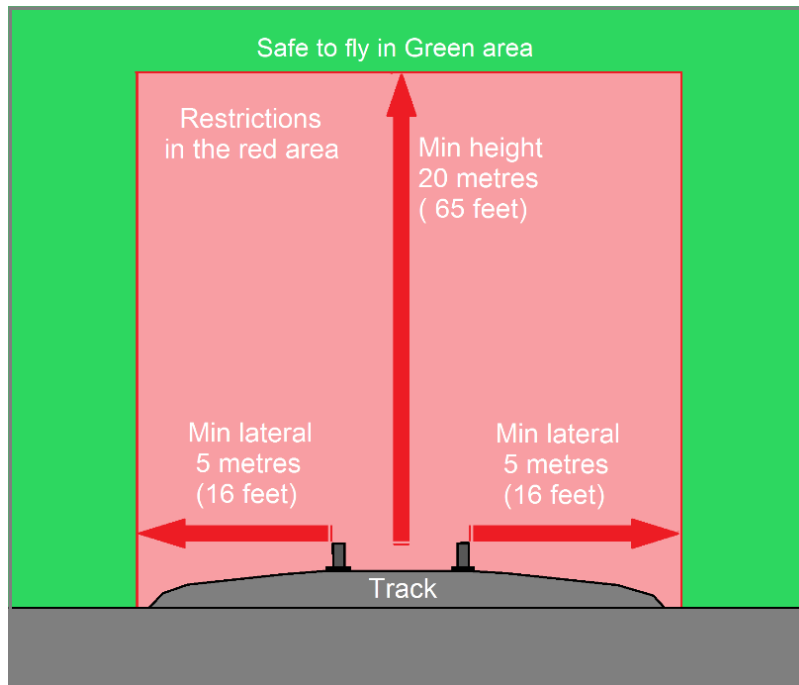
**NOTE:** This is because all UAS/Drone flights create a risk to the employees working on the track beneath (uninvolved people) also the trains moving along the track and the infrastructure itself. Network Rail Air Operations manages thousands of flights around the infrastructure each year and so there is a greater risk whatever the size of UAS/Drone.

All approved flights should be conducted by the UAS/drone operator within Visual Line of Sight (VLOS) unless specified in the flight notification submitted to Network Rail Air Operations.

Authority for Extended Visual Line of Sight (EVLOS) or Beyond Visual Line of Sight (BVLOS) operations may be granted by Network Rail Air Operations.

### 6.2 Network Rail in-house and framework UAS/drone operators

Network Rail and framework UAS/drone operators shall abide by the proximity permissions defined in Figure 1.



**Figure 1** Flight proximity permissions for NR/Framework UAS/drone operators

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Except through prior consultation with Network Rail Air Operations, UAS/drones shall not be flown closer than 20 metres (65 feet) vertically in height to the nearest running rail and shall not take off or land or be flown within 5 metres (16 feet) laterally to the nearest running rail, even if a possession and isolation is in force.

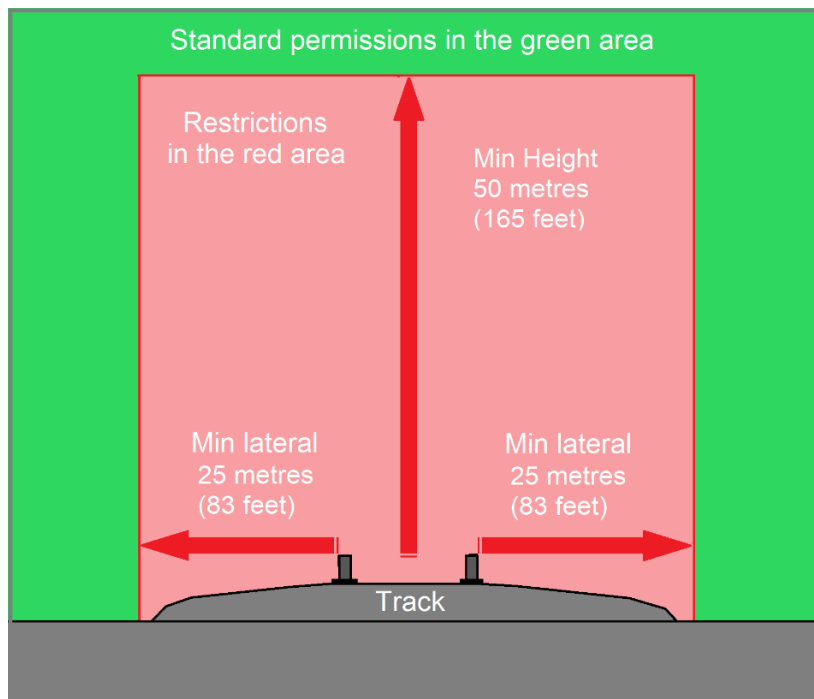
Except through prior consultation with the Network Rail Air Operations, UAS/drones shall not be flown closer than 10 feet (3.05 metres) to Overhead Line Electrification (OLE) or Third Rail, even if a possession and isolation is in force.

- NOTE 1:** Extra care should especially be taken if in close proximity to OLE or Third Rail under an isolation because non-electric/diesel traction could still be running.
- NOTE 2:** The above distances are a minimum safe distance and not a distance you are to fly from the asset unless safe.
- NOTE 3:** Only Internal and Framework operation can utilise the distances noted, all other UAS/Drone flights are to adhere to the distances noted below or through consultation with Network Rail Air Operations;

**6.2 Other commercial UAS/drone operators**

All other commercial UAS/drone operators shall adhere to the proximity permissions as defined in Figure 2:

**NOTE:** i.e those not specified in section 6.2.



**Figure 2 Flight proximity permissions for other commercial UAS/drone operators**

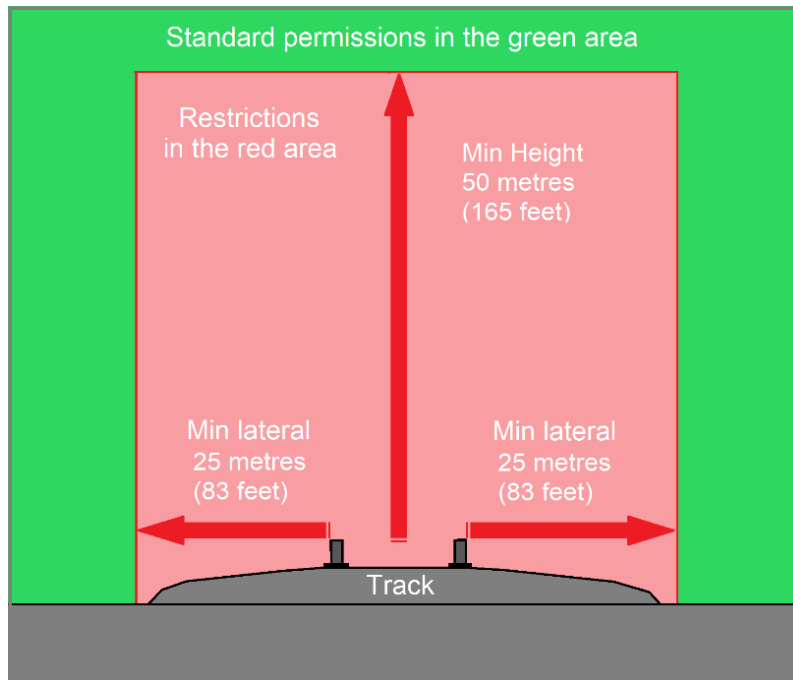
UAS/drone operators with an Operational Safety Case (OSC), Pre-Determined Risk Assessment (PDRA) or equivalent reduced distance permissions that allows them to

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fly closer than 50 metres, shall seek permission of the Network Rail Air Operations to fly closer than 50 metres to Network Rail infrastructure, to comply with Article 241 ANO.

### 6.3 Night-time UAS/Drone operations

Any UAS/drone operator flying at night shall abide by the proximity permissions defined in Figure 3:



**Figure 3 Proximity permissions for night flights**

Except through prior consultation with Network Rail Air Operations, when flying at night UAS/drones shall not be flown closer than 50 metres (165 feet) vertically in height to the nearest running rail and shall not take off or land or be flown within 25 metres (83 feet) laterally to the nearest running rail, even if a possession and isolation is in force.

### 7. Notification arrangements

Permission to fly near or over Network Rail infrastructure shall be requested from Network Rail Air Operations via the Flight Management System (FMS).

Air Operations shall authorise flights once all mitigating factors have been addressed.

**NOTE:** The Network Rail Air Operations department can be contacted via [droneenquiries@networkrail.co.uk](mailto:droneenquiries@networkrail.co.uk)

For emergency deployments, for Network Rail in-house, BTP and RAIB UAS/drone operators only, once safety checks have been completed they shall apply the Quick Activate function in the FMS to facilitate an instant authority to fly.

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## 8. Accident/Incident reporting

In addition to mandatory occurrence reporting process(es) (MOR), UAS/drone operators shall have a system in place to notify the following at the time of the incident:

- a) Route Control Manager (RCM), to include:
  - 1) Exact location, Engineer Line Reference, What Three Words or GPS Co-ordinates;
  - 2) State what the incident is;
  - 3) Which track is affected by the incident;
  - 4) What is the danger to the track;
  - 5) Stay in communication with the RCM and do not make any attempts to recover the UAS/Drone.
- b) Network Rail Air Operations Accountable Manager;
- c) The AAIB on 01252 512299

**NOTE:** *supply as much information as possible.*

A written report shall be sent to Network Rail Air Operations of any accidents, incidents or occurrences within 24 hours.

This report shall include:

- a) time of incident;
- b) date of incident;
- c) location of the incident, including full grid reference or latitude and longitude;
- d) the operator's name;
- e) details of equipment involved;
- f) a detailed description of the occurrence;
- g) any witnesses and their contact details; and
- h) photographs of the incident location including any equipment involved, location to neighbouring lineside equipment plus the aircraft itself prior to it being moved is safe to do so.

## Standard and control document briefing note

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<b>Title:</b> Unmanned Aircraft System (Drone/UAS) Operations	
<b>Publication date:</b> 4 September 2021	<b>Compliance Date:</b> 4 September 2021
<b>Standard/Control Document Owner:</b> Paul Ashton, Head of Operations Principles & Standards	
<b>Technical lead/contact for briefings:</b> Paul Lindup, National Drone Manager	<b>Tel:</b> 07701068131
<p><b>Purpose:</b></p> <p>This work instruction sets out:</p> <p>a) the operating arrangements for the preparation and execution of Unmanned Aircraft System (UAS/drones) flights near, on or over Network Rail infrastructure by:</p> <ol style="list-style-type: none"> <li>1) an approved Network Rail in-house drone operator;</li> <li>2) a commercial drone operator contracted by Network Rail (including those employed by a framework company or principle/tier 1 contractor); and</li> <li>3) commercial drone operators acting on behalf of lineside neighbours.</li> </ol> <p>b) the need for drone operators to mitigate against the risk of:</p> <ol style="list-style-type: none"> <li>1) damage to overhead lines, electrical wires or signalling systems;</li> <li>2) distractions to track staff or train drivers; and</li> <li>3) UAS system failure resulting in injury or derailment.</li> </ol> <p>This document provides a process for compliance with the:</p> <p>a) Air Navigation Order (ANO); and</p> <p>b) Civil Aviation Authority (CAA) Guidance Publication CAP 722</p>	<p><b>Scope:</b></p> <p>This work instruction applies to any person who needs to operate UAS/drones near, on or over Network Rail infrastructure and details:</p> <ol style="list-style-type: none"> <li>a) competency for drone operators;</li> <li>b) equipment permitted to be used;</li> <li>c) proximity to Network Rail Infrastructure;</li> <li>d) flight notification arrangements; and</li> <li>e) accident reporting.</li> </ol>

### Overview of change

This update incorporates an Emergency Change (NR/BS/LI/462) published 8 December 2020, concerning safety issues for flying UAS/drones at night and changes to legislation that came into force on 31 December 2020.

A comprehensive review of the standard has also been undertaken to improve flow, remove ambiguity and add additional context, so flights can be flown safely and legally.

### Detail of change

<u>Section(s)/clause(s)</u>	<u>Summary of changes</u>
1. Purpose	Improved clarity on the groups of UAS/drone operators that the standard applies to, plus removal of reference to European Union Aviation Safety Agency (EASA) rules following the United Kingdom's withdrawal from the European Union.
2. Scope	Minor changes to provide clarity on the scope of the standard
3. Definitions	Removal of definitions that no longer apply and improvement to several existing definitions to make them clearer.
4.1 Network Rail in house UAS/drone operations	Formalisation of legislative changes set out in NR/BS/LI/462 concerning UAS/drone regulations as required by Edition 8 of <a href="#">CAP 722 Unmanned Aircraft System Operations in UK Airspace</a> .
4.2 Framework and external UAS drone operations	Sentence structure simplified with additional notes added to help the reader understand the risks associated with flying over the railway infrastructure.
5. Minimum equipment requirements	Maximum Take-Off Mass (MTOM) including fuel has been increased from 7 Kg to 7.35 Kg. The requirement to seek approval to fly above this weight limit has been specified as '20 working days' before the scheduled flight, previously the standard stated '21 days'.



6. Proximity to Network Rail infrastructure	Formalisation of night flights for UAS/drones as out in Emergency Change NR/BS/LI/462, plus the inclusion of two new graphics depicting proximity permissions for: a) in-house/framework UAS/drone operators b) other commercial UAS/drone operators
7. Notification arrangements	Simplification of text with a new red requirement for UAS/drone operators to follow the flight management system (FMS) process when seeking authority to conduct a flight over the railway infrastructure.
8. Accident/incident reporting	Simplification of text and clarity on the steps the UAS/drone operator should follow in respect of an accident or incident. A new amber requirement describes the process and information to be relayed by the UAS/drone operator to the route control manager in the event of an accident or incident.  Additionally, a new amber requirement describes the need for the UAS/drone operator to take photos of the location and equipment used when an accident or incident has occurred.

**Reasons for change**

This change has allowed Network Rail to meet its commitment to incorporate Emergency Change (NR/BS/LI/462) into the standard and to deal with any ambiguity that existed in issue 3. Importantly, to address stakeholder concerns about the process to follow in the event of an accident or incident the standard now includes information that shall be relayed to the route control manager.

**Affected documents:**

<i>Reference</i> NR/L3/OPS/251 ISSUE 3 NR/BS/LI/462 ISSUE 1	<i>Impact</i> Superseded Withdrawn
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**Briefing requirements:**

**Will Briefing Management System be used to deliver the briefing to posts listed below? No**

*Technical briefings are given to those who have specific responsibilities within this standard/control document.*

*Awareness briefings are given to those who might be affected by the content but have no specific responsibilities within the standard/control document.*

*Details of the briefing arrangements are included in the associated briefing programme.*

*All posts identified for briefing must be as described in OrgPlus.*

Briefing (A-Awareness/ T-Technical)	Post	Route/Region	Responsible for cascade briefing? Y/N
A	Head of Operations Principles & Standards	System Operator	N
A	Operations Principles & Standards Expert	System Operator	N
A	Route Capital Delivery Director [Anglia]	Anglia Route	N
A	Route Capital Delivery Director [North & East]	North and East Route	N
A	Route Capital Delivery Director [East Midlands]	East Midlands Route	N
A	Route Capital Delivery Director [East Coast]	East Coast Route	N
A	Capital Delivery Director, Scotland	Scotland Region	N
A	Capital Delivery Director, Southern	Southern Region	N
A	Capital Delivery Director, North West & Central	North West and Central Region	N
Briefing (A-Awareness/ T-Technical)	Role	Function	
T	Network Rail In-house drone operators	Various	
T	Drone framework accountable managers	External	

**NOTE:** Contractors are responsible for arranging and undertaking their own Technical and Awareness Briefings in accordance with their own processes and procedures.