CIVIL AVIATION AUTHORITY
OF NEW ZEALAND

Advisory Circular
AC 91.XX

Revision 0

DATE

Extraction and Recovery Guidance Material – Pre-Technical Consultation

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.

An acceptable means of compliance is not intended to be the only means of compliance with a rule, and consideration will be given to other methods of compliance that may be presented to the Director. When new standards, practices, or procedures are found to be acceptable they will be added to the appropriate AC.

An AC reflects the Director's view on the Rules and legislation. It expresses CAA policy on the relevant matter. It is not intended to be definitive. Consideration will be given to other methods of compliance that may be presented to the Director. When new standards, practices, or procedures are found to be acceptable they will be added to the appropriate AC. Should there be any inconsistency between this information and the Rules or legislation, the Rules and legislation take precedence.

An AC also includes guidance material to facilitate compliance with the rule requirements. Guidance material must not be regarded as an acceptable means of compliance.

An AC may also include **technical information** relevant to the standards or requirements.

Purpose

This AC provides guidance material related to Extraction and Recovery to those pilots conducting IFR operations and present AMC for showing compliance with the requirements of CAR 92.261(a)(2)(iii).

Related Rules

This AC relates to Civil Aviation Rule Parts 61, 91, 119, 121, 125 and 135.

Change Notice

This is the initial issue of this AC

Cancellation Notice

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1. Introduction

In 2015 CAA commissioned a study[1] that investigated the safety impact of using GPS as a sole means for aircraft navigation within the NZ FIR. The major recommendation of the study was:

> *"…that GPS sole means navigation does not provide an adequate level of safety within the New Zealand FIR. It lacks the ICAO PBN Manual's requirement for continuity. This creates vulnerabilities, and the New Zealand aviation system does not provide sufficient mitigation to these risks without having access to an alternative navigation system."*[2]

CAR91.621(a)[3] states:

(a) A person must not operate an aircraft using a navigation specification referred to in rule 91.263 unless all of the following requirements are met –

(1) the aircraft meets the airworthiness and performance requirements determined by the Director as specified in a notice referred to in rule 91.263;

(2) the person –

(i) *is suitably trained and qualified for the navigation specification applicable to the planned route and airspace as specified in a notice;*

(ii) complies with the operational procedures and any limitations applicable to the navigation specification, route, or airspace as specified by the Director in a notice;

(iii) has an alternative means of navigation if the primary means of navigation fails at any point on the planned route;

The intent of CAR 92.261(a)(2)(iii) is for all aircraft conducting IFR flights to be capable of landing safely in the event of loss of their Primary Means of Navigation (PMoN), irrespective of whether that loss is due to an internal aircraft system failure, loss of GNSS signal, or failure of a system external to the aircraft (e.g. GNSS disruption or GBNA failure). To enable this intent to be met, the loss of the PMoN must be proactively planned for prior to the flight departing, as opposed to the situation being addressed in a reactive manner when it occurs.

While PBN operations conducted within the NZFIR may be safely conducted using a PMoN that is reliant on GNSS, in planning for an event requiring Extraction operators should not plan to use an Alternative Means of Navigation (AMoN) that is reliant on GPS for the safe Recovery of their aircraft.

CAR 92.261(a)(2)(iii) is considered to be complementary to CARs 121.353, 125.353 and 135.353 which require operators to ensure that aircraft used for air operations are equipped with sufficient navigation equipment to enable continued safe navigation for the route being flown, in the event of the failure of any onboard independent system.

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1 GNSS Sole Means Recommendation Report – Doc Ref GSM001 Iss 2, 16 NOV 2015

2 Ibid, Page 2 of 29

3 Note that Rules 91.261 and 91.263 are draft rules being consulted on as at December 2020

2. Definitions

For the purpose of this AC the following definitions are used:

TERM	DEFINITION
Extraction	Means the immediate response to loss of navigational capability/performance with respect to the route/procedure being flown. “To extract” is to safely transition the aircraft from being navigated by way of its PMoN to being navigated by way of an AMoN suitable for Recovery. It is a planned response to the loss of PMoN as opposed to being a reactive response. Extraction starts upon the PIC recognizing that their aircraft has lost the navigational capability required for the route and phase of flight being flown. Extraction ends once the aircraft is being navigated using an AMoN suitable to recover the aircraft.
Recovery	Means what occurs once the pilot has completed an Extraction and will either enable the flight to continue safely to the intended destination or result in a diversion to a suitable alternate destination.

3. Abbreviations

The following abbreviations pertaining to this AC are included below. See also Civil Aviation Rules Part 1 for other abbreviations.

ABBREVIATION	DEFINITION
AMC	Acceptable Means of Compliance
AMOC	Alternative Means of Compliance
AMoN	Alternative Means of Navigation
DME	Distance Measuring Equipment
DR	Deduced Reasoning (or Dead Reckoning)
E&R	Extraction and Recovery
GBNA	Ground Based Navigation Aid
GNSS	Global Navigation Satellite System
MSA	Minimum Safe Altitude
MVA	Minimum Vectoring Altitude
NAA	National Airworthiness Authorities
NZFIR	New Zealand flight information region
PBN	Performance Based Navigation
PIC	Peron In Charge
PMoN	Primary Means of Navigation
RAIM	Receiver Autonomous Integrity Monitoring
SMS	Safety Management System

4. AC Structure

This AC is divided into the following broad sections:

4.1. General Information

Applicable to all pilots considering the impact of an E&R event, this section addresses:

4.1.1 Planning for Extraction and Recovery

4.1.2 Factors causing loss of navigational capability

4.1.3 Impact of loss of navigational capability

4.1.4 The fundamental elements of E&R procedures

4.2. Acceptable Means of Compliance (AMC)

AMC presents a limited range of options for ensuring the ability to conduct E&R safely. It is aimed at the majority of operators conducting IFR operations within the NZ FIR. This section addresses:

4.2.1. Requirements

4.2.2. Use of Dead Reckoning during Extraction

4.2.3. Recovery Fuel Considerations

4.2.4. E&R Training Requirements

4.3. Alternate Means of Compliance

This section is aimed at those operators who are unable to, or who elect not to comply using the AMC. An AMOC allows operators to propose alternative procedures to addressing the safety intent of CAR 92.261(a)(2)(iii) which are tailored to reflect their own specific operational circumstances. This AC presents the requirements that an AMOC proposal must meet and the criteria against which these proposals will be assessed by CAA:

4.3.1. General

4.3.2. Compliance with CAA Rules

4.3.3. Safety Criteria for Safety and Recovery AMOC Proposals

4.3.4. Format of AMOC Proposals

4.3.5. Information requirements for AMOC Proposals

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4.3.7. Use of AC from other NAAs

4.3.8. CAA Assessment of AMOC Proposals

4.3.9. Correspondence with CAA

4.1 General Information

4.1.1 Planning for E&R:

Thorough pre-flight planning is the foundation upon which preparation for and execution of a successful E&R is based. By considering the potential loss of your PMoN during pre-flight planning and understanding the impact of that loss on an aircraft's navigational capability during each phase of flight, prior to getting in the air, the pilot is able to make contingency plans in a relatively low-stress environment. Additionally, contingency fuel requirements need to be addressed to ensure that a safe recovery to the planned alternate destination can be made if required.

Finally, when planning for an E&R event pilots should reflect on their own capability and competency to deal with such an occurrence.[4] To address all of these planning considerations adequately and successfully requires the application of training, experience and attitude which when employed together results in "airmanship". The goal of this AC is to present information that will assist pilots with their application of airmanship when preparing for an E&R contingency situation.

4.1.2 Factors Causing a Loss of Navigational Capability:

The loss of navigational capability includes any failure or event causing the aircraft to no longer satisfy the requirements of the navigation specification being flown at the time. While the need to consider loss of navigational capability has become more apparent as GNSS based navigation systems have proliferated throughout aviation, the underlying reasons for such planning is equally relevant to an aircraft fitted with only GBNA-based navigation systems.

The following examples are events that can lead to or indicate the loss of your aircraft's navigational capability:

- Loss of GNSS Signal-In-Space (SIS): This could be due to a range of factors including geography, localised jamming, space weather or satellite constellation issues. This may result in your GNSS system displaying a Loss of Integrity (LOI) warning.[5]
- On-board system failure: The GNSS receiver (or GBNA-based PMoN) system or equipment fails in flight.
- RAIM warning in flight: GNSS satellite constellation geometry that is unsatisfactory for resolving a GNSS position solution is a primary cause of RAIM warnings. Prolonged display of a RAIM warning indicates that the GNSS receiver's navigational capability may not be reliable.

[4] Pilots conducting Single Pilot IFR operations should be familiar with the content of CAA AC 91-11 which presents more details on how to adequately prepare for and conduct IFR flight. While focused on Single Pilot IFR operations the philosophy advocated in the AC has relevance to the conduct of all IFR flights.

[5] Loss of the GNSS SIS may also impact other aircraft systems that are reliant on GNSS such as an ADS-B system.

- A GNSS receiver operating in DR
- A GNSS receiver displaying operating in DR for longer than one minute indicates the loss of that GNSS receiver's navigational capability.

4.1.3 Impact of Loss of Navigational Capability:

The consequences of a loss of navigational capability are dependent upon the operational environment at the time and the availability of a suitable AMoN. In the event of losing the aircraft's PMoN, the PIC must be aware of what navigational capability still exists in their aircraft. This will differ from aircraft to aircraft based on its navigation system equipment. As the required navigation performance for a PBN procedure can change depending upon the phase of flight, the PIC must also take this into account when planning for the loss of the primary means of navigation.

The following list identifies some of the potential considerations following a loss of PMoN:

- An aircraft may have on-board systems that enable it to continue operating to the navigation specification's required levels of performance for the respective phase of flight.
- The aircraft may be alerted by Air Traffic Control (ATC) that a deviation from track exists, in particular where instrument flight procedures rely on ATC to provide a performance monitoring and alerting function at particular locations (e.g. RNAV 1 procedures).
- An aircraft may extract and recover using an AMoN based on legacy[6] ground based navigation aids.
- Aircraft not equipped with operative DME will have fewer options for recovery.

4.1.4 The Fundamental Elements of E&R Procedures:

E&R procedures need not be complicated. When dealing with a contingency event simplicity is usually best. The following points are considered to be the fundamental elements that need to be addressed by E&R procedures:

a) Pre-flight planning - Proactively plan for the loss of navigational capability prior to your departure as opposed to dealing with the situation reactively when it occurs.

b) Upon loss of navigational capability:
   - Aviate: Identify and initiate Extraction procedure
   - Navigate: Ensure aircraft is kept clear of obstacles, terrain and traffic
   - Communicate: As soon as practicable inform ATC of your situation and your intended course of action.

6 DME, ILS, LLZ, NDB, VOR

c) Upon extracting to the AMoN:

- Aviate: Commence Recovery
- Navigate: Recover aircraft to planned destination (if navigational capability exists) or divert to suitable planned alternate destination.
- Communicate: Keep ATC and other airspace users informed of your situation and intentions.

4.2 Acceptable Means of Compliance

The following AMC presents a range of options for how flights conducted under IFR can be extracted and recovered in an acceptably safe manner and thereby meet the requirements of CAR 92.261(a)(2)(iii). If electing to comply with this AMC, operators are required to comply with each aspect identified below. If not complying with all aspects of this AMC, an approved AMOC will be required.

In order to qualify for the AMC operators must ensure that they address each of the following requirements:

4.2.1 Requirements

a) Procedures:

- Part 121, 125 and 135 operators conducting air transport operations are required to have E&R procedures documented in their CAA approved exposition. These procedures need to cover each route and procedure flown by the operator.
- Part 91 operators, while not needing to have documented procedures, should still ensure that their E&R planning is relevant to the route planned to be flown and addresses the elements identified in this section.

b) Pre-flight planning:

- Plan for the loss of navigational capability prior to your departure.
  - Consider each phase of flight (Departure, Enroute, Arrival, Approach)
- Review E&R procedures. Assess the potential impact of the following factors:
  - Terrain / MSA
  - Traffic
  - Weather
  - Aircraft navigational capability and serviceability
  - Fuel
- Reflect on your ability to competently deal with an E&R event
- Brief your crew or self-brief if conducting single-pilot IFR

c) Aircraft Equipage:

- Aircraft are required to be suitably equipped for the planned E&R, including:
  - An AMoN whose functioning and performance cannot be reliant on GNSS
    - At the current time, the only acceptable solution is for aircraft to be equipped with a GBNA-based navigation system suitable for the intended destination routes and alternate routes intended to be flown.
  - Anti-icing systems where an E&R could result in the aircraft being flown in icing conditions.
  - Other aircraft systems needed for the purpose of Extraction and/or Recovery.
- If an aircraft is not equipped with operable DME, this must be accounted for when planning for E&R and will likely place additional constraints on operational capability.

Note: *If operating in VMC Extraction to VFR is always possible. However, this does not preclude the need for aircraft to be suitably equipped for Recovery to GBNA serviced aerodromes where required.*

d) Meteorological Conditions:

- Forecast weather conditions en-route may influence decisions on how Extraction will be conducted for that phase of flight:
  - If in IMC, Extraction via appropriate means and Recovery to a GBNA-based IFP must be planned
  - If in VMC, the option to extract to VFR exists
- Forecast weather conditions at the planned destination aerodrome will determine whether an alternate aerodrome needs to be identified as per CAR 91.405:
  - If an alternate aerodrome is required, then Extraction to IMC and an IFR Recovery to an aerodrome serviced by GBNA instrument procedures must be planned for the arrival and approach phases.
  - If an alternate aerodrome is not required, then Extraction to VMC and a VFR Recovery can be planned for at the intended destination.
    - The possibility of this option not being feasible at the intended time of landing should still be considered during flight planning.

e) GBNA Coverage En-route:

- If the aircraft is to be operated outside of GBNA coverage then:
  - the use of Deduced Reckoning (DR) during Extraction must be considered, within the constraints identified below (Refer to section 4.2.2 relating to the use of DR), or

- the use of an alternative aircraft system capable of providing a navigational capability at least equivalent to DR[7] during Extraction must be planned for.

f) Airspace and traffic:

- Consideration should be given to
  - Whether the departure, en-route and arrival phases of flight are wholly or partially contained within controlled airspace, and if so, whether this airspace has provision for ATC surveillance services to enable RADAR vectoring if required for E&R.
  - What limitations there are on ATC's ability to provide surveillance and navigation support in the event of an E&R procedure, including:
    - whether procedural control is the only tool available to the controller,
    - Whether the aircraft might be below MVA,
    - The impact of other traffic in the vicinity who may also be affected by a GNSS outage and its effect on:
      - Aircraft separation
      - Duration of holding

		Alternate aerodrome required by CAR 91.405?		
		Yes	No	
Scenario	Destination has GBNA procedures	Plan to recover to an aerodrome serviced by GBNA instrument procedures	Plan for loss of PMoN No Alternate required to be declared on flight plan	Aircraft is to be equipped for GBNA procedures
	Destination does not have GBNA procedures			
	Destination and Alternate have PBN procedures only	Approved AMOC required		
	Extraction to VFR is possible in all scenarios above, but this does not preclude the need for aircraft to be suitably equipped for diversions to GBNA serviced alternates where required			

The table above summarises the E&R AMC in relation to aircraft equipage, meteorological conditions and Recovery aerodrome infrastructure requirements.

4.2.2 Use of Deduced (Dead) Reckoning (DR) during Extraction

For the purpose of this AC, DR is defined as the estimation of your current aircraft position by advancing an earlier known position by the application of direction, time and speed data.

Note: *"DR" as mentioned here is not the use of a GNSS receiver operating in "DR Mode".*

The use of DR as a means of navigation is, within the constraints identified below, an acceptable means of compliance for the Extraction of an aircraft which has lost its PMoN and is in the process of transitioning to its AMoN.

[7] E.g. Inertial Reference Unit. The use of alternate aircraft systems must be based supported by evidence from the aircraft type certificate holder.

a) Constraints applicable to the use of DR:

The use of DR for Extraction purposes must be carried out within the following constraints:

- The aircraft must be operating at an altitude that is equal to or higher than the current area minimum altitude, 25NM minimum sector altitude or other applicable route MSA, or
- If below an alternative published MSA, a climb to MSA on a safe heading should be initiated immediately upon loss of navigational capability, or
- If below MSA, the aircraft is operating in VMC maintaining terrain clearance visually, and this is maintained for the time that DR is being used (e.g. Above a cloud layer obscuring all visual reference to the ground but below sector/grid MSA), or
- If below an alternative published MSA, a climb to an applicable Minimum Vectoring Altitude with assistance from air traffic control once in controlled airspace

Note: *DR is not acceptable as an AMoN in its own right so cannot be planned to be used for Recovery purposes.*[8]

b) Procedures for use of DR:

If DR is to be applied as an Extraction technique by a certificated air operator, the relevant procedures must be specified in the exposition and included in the operational training program to ensure continued competency in their application.

Part 91 operators intending to use DR should consider its use as part of their flight planning activities.

c) Training for use of DR:

DR is part of the CAA NZ pilot training syllabi and as such, significant time may have elapsed between learning to use DR during training and its application during an actual Extraction. If the use of DR is anticipated during Extraction, then the PIC must ensure they are proficient in its use.

4.2.3 Recovery Fuel Considerations

When planning for E&R the contingency fuel required to be carried is another primary consideration. IFR contingency fuel requirements are defined in CAR 91.403 for Part 91 operations while the requirements for air transport operators to establish IFR fuel policies is specified in CARs 121.75, 125.61 and 135.61.

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8 There are specific IFR routes within the NZ FIR that allow the use of DR in specific portions of the route where there is known poor reception/lack of GBNA signal. The constraints regarding the use of DR stated in this AC are not intended to override the ability to use DR on those specific IFR routes.

For all operators, the need to carry additional contingency fuel in the event of an E&R occurrence needs to be considered as part of flight planning, in addition to normal IFR contingency fuel requirements.

4.2.4 E&R Training Requirements

E&R contingency procedures and non-normal situations can present significant challenges for the PIC/flight crew. As part of PBN/IFR training pilots conducting Part 91 operations should ensure they are adequately trained to address the range of situations that may result in an Extraction and Recovery needing to be conducted.

Note: *Knowledge of, and ability to derive, an Extraction and Recovery plan will be part of the Instrument Rating issue check and renewal.*

Part 121, 125 and 135 air transport operators also need to ensure that adequate training is provided for E&R contingency procedures and non-normal operations and this is to be documented in their CAA approved exposition.

As a minimum, training for E&R should address:

- Aircraft navigation systems and their constituent equipment
  - PBN capabilities of the aircraft
- Other relevant aircraft systems/capabilities (e.g. RADALT, ice protection)
- Loss or degradation of navigational capability caused by:
  - Aircraft navigation equipment failures
  - Failures external to the aircraft
    - Warnings / Cautions / Alerts related to on-board/external failures
- Impact of loss or degradation of navigational capability on route(s) flown during each phase of flight:
  - Departure
  - En-route
  - Arrival
  - Approach
  - Missed approach
- Contingency procedures to be used in the event of loss of GNSS signal
  - Impact of loss of GNSS signal on other aircraft systems (e.g. TAWS, ADS-B etc)
- Contingency procedures to be used in the event of loss of navigation equipment

  - Where the contingency procedures require reversion to a conventional IFP the PIC must complete any preparation for this reversion (e.g. manual selection of NAVAID) prior to commencing any portion of the IFP.
- Use of DR (if this navigation technique is to be used during Extraction)
- Use of AMoN
- How to achieve and maintain separation from terrain and obstacles.
- Currency in use of AMoN, which may include conducting:
  - GBNA instrument flight procedures
  - ILS approaches
- Communication with ATC
  - Failures or circumstances which have affected the aircraft's ability to maintain the required navigation specification accuracy
  - Intentions following loss of PMoN
- Fuel planning for Recovery to alternate destination(s)

4.3 Alternate Means of Compliance

4.3.1.General

Those operators who are unable to, or who choose to, adopt an approach other than that specified in the AMC previously defined in this AC are able to propose an AMOC. The Director may approve an AMOC for an operator with regard to CAR 92.261(a)(2)(iii) if, having given due regard to the nature of the operation, they are satisfied that the AMOC meets the following safety objectives:

- It addresses the safety intent of CAR 92.261(a)(2)(iii),
- It provides an acceptable level of safety commensurate with the nature of the operation, and
- It is tailored to reflect the applicant's own specific operational circumstances, routes and aircraft equipage.

In applying for an AMOC the onus lies with the applicant to provide appropriate and sufficient evidence that their proposal meets the safety objectives. Supporting evidence shall consist of a combination of material created and collated by the applicant that addresses the "Information Requirements" identified later in this section and which proves the veracity of their proposal.

AMOC proposals will be assessed by CAA and, if found to meet the previously stated safety objectives, will be approved by the Director for use by that particular operator. AMOCs will not be approved for "general use": they are approved for individual operators to use on specific routes with specific aircraft equipped with specific equipment supplemented by specific procedures and training requirements. If there is scope for an AMOC to have broader applicability it will be incorporated into the AMC section of this AC.

Prior to compiling an AMOC proposal, applicants are strongly recommended to become familiar with the Introduction, Definitions and General Information sections of this AC as they contain information that is relevant to all E&R situations. The AMC section of this AC also provides information that is likely to be of some assistance to AMOC applicants.

4.3.2 Compliance with CAA Rules:

While an approved AMOC provides the applicant with an alternative means of compliance with CAR 92.261(a)(2)(iii), an approved AMOC does not provide an exemption from this rule. CAA's standard Exemption process will need to be followed if an AMOC proposal incorporates aspects that are non-compliant with other CAA rules.

4.3.3. Safety Criteria for Extraction and Recovery AMOC Proposals

The acceptable level of safety needing to be demonstrated for an E&R AMOC is determined by the nature of the operation for which the AMOC is being proposed:

- Part 91 (Private Operations): The acceptable level of safety for a private operator is that their E&R AMOC proposal allows them to safely land their aircraft in the event of losing their PMoN and that the overall risk level is no greater than would be achieved if they were adhering to the AMC. This qualitative approach requires the operator to consider their proposed AMOC against the AMC to ensure that it does not introduce an increased level of risk.
- Certificated Air Operators: For these operators the acceptable level of safety for an AMOC proposal for E&R is that it allows them to land their aircraft in the event of losing their PMoN and that all applicable aviation hazards and their attendant safety risks have been identified and reduced to a level that is As Low As Reasonably Practicable (ALARP). [9]
    - Those operators who have a certified SMS under CAR Part 100 will be familiar with this approach and will be expected to manage and develop their AMOC proposals within their SMS frameworks. For those operators who are yet to achieve SMS certification, the AC addressing Risk Management contained in CAA AC100-1 should be used as the basis for the development of their AMOC proposals.

4.3.4 Format of AMOC Proposals

There is no specified format that AMOC proposals are required to meet – applicants are free to choose their own format. The primary consideration is the content of the proposal: applicants need to ensure that their AMOC proposals address all the Information requirements specified further below.

[9] For further information regarding the application of risk management within New Zealand's aviation environment and the application of the ALARP principle refer to CAA AC100-1 (Safety Management Systems).

4.3.5 Information Requirements for AMOC Proposals

Applicants are required to collate a body of evidence that demonstrates the safety of their E&R AMOC proposal and which must address the information requirements of this section. The list below should be considered as the minimum information set needing to be addressed. Applicants are encouraged to provide additional supporting information when considered relevant.

- Rationale for proposing an AMOC
  - Reason(s) applicant is unable to or chooses to adopt an approach other than that specified in the AMC
- Proposed route(s)/procedure(s) covered by the AMOC proposal
  - Departure location
  - Destination
  - Alternate(s)
  - Recovery destinations (if different from Alternates)
- Applicable navigation specifications for the proposed route(s)/procedure(s)
- Application of Risk Management Principles:
  - For certificated air operators, apply Risk Management principles across the full breadth of the AMOC proposal (Refer to CAA AC100-1)
  - Identify all hazards associated with the proposed E&R AMoC
    - Conduct risk assessment and mitigation activities as appropriate.
    - Ensure that the hazard identification and risk management process include, but are not limited to, the following hazards:
      - Icing conditions
      - Terrain
      - Obstacles
      - Aircraft Navigational capability
      - Fuel
      - Traffic[10]

Note: *The results of the risk management process should show that all residual risk levels have been reduced to a level As Low As Reasonably Practicable (ALARP)*

[10] In addition to considering hazards and risks discretely the risk management process should also give due consideration to any inter-dependencies between the risks and the impact this has on the overall risk picture.

- Procedures:
  - Part 121, 125 and 135 operators conducting air transport operations are required to include E&R procedures in their AMOC proposals.
  - Part 91 operators, while not needing to have documented procedures, should still ensure that their E&R planning is relevant to the route planned to be flown and addresses the elements identified in this section.
    - Identify any limitations associated with the applicability of the proposed E&R procedures
- Pre-flight planning:
  - Identify how the loss of PMoN is addressed in pre-flight planning, prior to departure:
    - Planning for loss of PMoN during each phase of flight (Departure, En-route, Arrival, Approach) is to be considered
    - Pre-flight crew briefing content for E&R scenarios (self-briefing if conducting single-pilot IFR)
    - Crew should reflect on their own ability to competently deal with an E&R event
- Aircraft equipage
  - Description of PMoN (Background information)
  - Means of navigation during Extraction
    - If proposing to use DR during Extraction, define the constraints associated with its use
      - AMOC applicants may propose to use DR during an Extraction, the extent of which is beyond the constraints presented in Section 3.2.2. All potential hazards associated with the use of DR are to be identified and mitigated appropriately.

Note: *DR cannot be proposed to be used as means of navigation in its own right – it is a navigation technique that can only be used to transition between the PMoN and the AMoN.*

  - **Description of AMoN**[11]
    - Confirm it does not rely on GNSS signals for its functioning or performance
    - System/equipment performance specifications
      - Evidence should include data from aircraft and/or equipment manufacturers
    - Description of how the AMoN will be used in an E&R scenario
    - Specification of all aircraft equipment required to be serviceable at the time of aircraft dispatch

[11] The AMoN may be supported by aircraft systems that are not reliant on legacy navigation capabilities. E.g. Ground mapping weather RADAR.

- Consider impact on existing aircraft MEL(s)

Note: *If operating in VMC Extraction to VFR is always possible. However, this does not preclude the need for aircraft to be suitably equipped for the proposed E&R AMOC scenario.*

- GBNA Coverage
  - Identify whether the AMOC proposal has any reliance on the aircraft operating within areas of GBNA coverage
- Meteorological Conditions:
  - Identify how forecast weather conditions may influence decisions on the conduct of E&R for each phase of flight, including:
    - at the planned destination aerodrome,
    - at any potential alternate or aerodrome or planned recovery destination
  - Identify any weather minima that limits the applicability of the proposed AMOC.
- Airspace and traffic:
  - Identify whether the departure, enroute and arrival phases of flight are wholly or partially contained within controlled airspace, including:
    - Whether the AMOC proposal is reliant on ATC providing any surveillance services.
    - What limitations are there on ATC's ability to provide surveillance and navigation support in the event of an E&R procedure, including:
    - Whether procedural control is the only tool available to the controller,
    - Whether the aircraft might be MVA,
    - The impact of other traffic in the vicinity who may also be affected by a GNSS outage and its effect on:
      - Aircraft separation
      - Duration of holding

Note: *As part of compiling their supporting evidence applicants may consider whether consultation with the ANSP or an Instrument Flight Procedure design organisation might assist with their AMOC proposal.*

- Human Factors
  - Identify what impact the proposed AMOC will have on crew / single pilot workload and how this is mitigated. As a minimum consideration should be given to:
    - The perceived increase in risk due to loss of PMoN
    - The impact on content of crew briefings conducted prior to each respective phase of flight
    - The use of automation during Extraction and Recovery.

- Training
  - The E&R training requirements needing to be addressed in an AMOC proposal are identical to those described in the AMC section of this AC
    - Refer to the “AMC E&R Training Requirements” section.
  - Identify Check and Training procedures for
    - Initial and
    - Recurrent training, and
    - Define crew qualification requirements
- Contingency Fuel Planning
  - Identify fuel planning requirements to address E&R
    - Consider impact on existing IFR fuel policies required by CARs 121.75, 125.61 or 135.61.
- Identify any AC published by other NAAs that form part of the AMOC proposal
  - See discussion below that describes how the potential application of AC from other NAAs must be addressed.

4.3.6 Demonstration of E&R AMOC Proposals

Applicants are expected to have conducted their own testing to demonstrate the safety and suitability of their E&R AMOC proposal. Any demonstrations are expected to be conducted:

- In a simulated-IFR environment on non-revenue flights
- By crew with a cross-section of experience and capabilities
- In a manner that aims to emulate the cockpit environment in an actual E&R scenario
- In a structured manner that allows for the capturing of results
- To demonstrate the repeatability of the proposed AMOC

Results of any testing and demonstrations of the proposed AMOC conducted by the applicant should be submitted to CAA as part of the supporting evidence, and include details such as:

- Flight path accuracy achieved with regards to the planned Extraction and subsequent Recovery
- Repeatability of the results achieved
- Identification of what impact the test results had on the content of the proposed AMOC

4.3.7 Use of AC from other NAAs

AMOC applicants may identify guidance material that has been published by other NAAs that they believe has relevance to their proposed AMOCs (e.g. FAA AC 90-80C, 'Approval of Offshore Standard Approach Procedures, Airborne Radar Approaches, and Helicopter En Route Descent Areas'.) As other NAA guidance material is typically tailored to their own specific national regulatory environment, it can be challenging for CAA to accept the use of this AC on the whole without there being a thorough analysis of its applicability in the New Zealand aviation context.

Therefore, while the use of other guidance material developed by other NAAs to support an AMOC proposal will be considered by CAA, the applicant will need to provide supporting evidence that shows the direct applicability of that AC and its underlying assumptions to the specifics of their operation, their particular circumstances/operational scenario and its relevance to the broader NZ FIR. Additionally, the operator will be required to identify any new or potential risks created from taking such an approach and provide adequate analysis and mitigation of any risks identified.

4.3.8 CAA Assessment of AMOC Proposals

At a minimum, all AMOC proposals will be subject to desktop review by CAA inspectors. Depending upon the nature of the proposal, CAA may request applicants to also conduct a proving flight for CAA staff to observe the application of the AMOC in a demonstration scenario.

To ensure sufficient rigour is applied to the assessment of AMOC proposals, the assessment process is likely to involve inspection staff from the flight operations, airworthiness and aeronautical services functions within CAA.

4.3.9 Correspondence with CAA

All AMOC proposals are to be sent to [TBC - CAA mailbox for AMOC proposals].

Any correspondence with CAA regarding an AMOC proposal should be identified with "Application for AMOC against CAR 92.261(a)(2)(iii) for [applicant name]".