Comment-Response Document 2014-18

CAT operations at night or in IMC using single-engined turbine aeroplanes

CRD TO NPA 2014-18 — RMT.0232 & RMT.0233 (MDM.031(A)&(B)) — 11.11.2015

Related Opinion No 06/2015

EXECUTIVE SUMMARY

This Comment-Response Document (CRD) contains the comments received on NPA 2014-18 (published on 17 July 2014) and the responses provided thereto by the Agency.

In total, 157 comments were received by the end of the consultation period from interested parties, including EU Competent Authorities (CAs), aircraft manufacturers, air operators, and associations.

In general, the commentators were supporting the concept of CAT SET-IMC operations as well as the related proposals provided in NPA2014-18. However, the comments received on said NPA led to several changes to the proposed Acceptable Means of Compliance (AMC) and Guidance Material (GM), as well as to further amendments to the Annexes (Part-ARO, Part-ORO, Part-CAT and Part-SPA) to Regulation (EU) No 965/2012.

Based on the comments and responses thereto, Opinion No 06/2015 was developed and it is published concurrently with this CRD.

For information, the Agency developed the related draft AMC/GM which are also published in this CRD.

Applicability		Process map	
Affected regulations and decisions:	Regulation (EU) No 965/201; Annex II (Part-ARO); Annex III (Part-ORO); Annex IV (Part-CAT); Annex V (Part-SPA)); and related AMC/GM.	Concept Paper:	No
		Terms of Reference (Issue 2):	2.10.2013
		Rulemaking group:	Yes
		RIA type:	Full
		Technical consultation during NPA drafting:	No
Affected stakeholders:	Operators; and National Aviation Authorities (NAAs).	Publication date of the NPA:	17.7.2014
		Duration of NPA consultation:	3 months
Driver/origin:	Level playing field	Review group:	Yes
		Focussed consultation:	Yes
Reference:	JAA NPA OPS 29 Revision 2; QINETIQ/EMEA/IX/CR0800029/2; ICAO Annex 6, Part I.	Publication date of the Opinion:	2015/Q3
		Publication date of the Decision:	2016/Q3

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1. Procedural information

1.1. The rule development procedure

The European Aviation Safety Agency (hereinafter referred to as the 'Agency') developed this Comment-Response Document (CRD) in line with Regulation (EC) No 216/2008[1] (hereinafter referred to as the 'Basic Regulation') and the Rulemaking Procedure[2].

This rulemaking activity is included in the Agency's 4-year Rulemaking Programme, under RMT.0232 & RMT.0233 (MDM.031(A)&(B)). The scope and timescale of the task were defined in the related Terms of Reference (Issue 2)[3] (see process map on the title page).

The draft text of the proposed Implementing Rules (IRs) has been developed by the Agency based on the input of the Rulemaking Group RMT.0232 & RMT.0233 (MDM.031(A)&(B)). All interested parties were consulted through NPA 2014-18[4], which was published on 17 July 2014. 157 comments were received from 26 interested parties, including industry, National Aviation Authorities (NAAs) and individuals.

The text of this CRD has been developed by the Agency based on the input of the Review Group RMT.0232 & RMT.0233 (MDM.031(A)&(B)) [5].

The process map on the title page contains the major milestones of this rulemaking activity.

1.2 The structure of this CRD and related documents

This CRD provides a summary of comments and responses as well as the full set of individual comments and responses thereto received to NPA 2014-18. The resulting AMC/GM are provided in Chapter 3 of this CRD.

1.3 The next steps in the procedure

The Opinion ,published concurrently with this CRD, contains proposed changes to European Union (EU) regulations. It is addressed to the European Commission, which shall use it as a technical basis in order to prepare a legislative proposal.

The Decision containing AMC and GM will be published by the Agency when the related IR is adopted by the Commission.

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1 Regulation (EC) No 216/2008 of the European Parliament and of the Council of 20 February 2008 on common rules in the field of civil aviation and establishing a European Aviation Safety Agency, and repealing Council Directive 91/670/EEC, Regulation (EC) No 1592/2002 and Directive 2004/36/EC (OJ L 79, 19.3.2008, p. 1).

2 The Agency is bound to follow a structured rulemaking process as required by Article 52(1) of the Basic Regulation. Such process has been adopted by the Agency's Management Board and is referred to as the 'Rulemaking Procedure'. See EASA Management Board Decision concerning the procedure to be applied by the Agency for the issuing of Opinions, Certification Specifications and Guidance Material (Rulemaking Procedure), EASA MB Decision No 01-2012 of 13 March 2012.

3 http://easa.europa.eu/document-library/terms-of-reference/tor-rmt0232-0233-mdm031ab-issue-2.

4 http://easa.europa.eu/document-library/notices-of-proposed-amendment/npa-2014-18.

5 http://easa.europa.eu/document-library/npa-review-groups/commercial-air-transport-operations-night-or-imc-using-single.

2. Summary of comments and responses

157 comments were submitted by 26 commentators, including eight EU competent aviation authorities, two aircraft manufacturers, seven air operators and several associations.

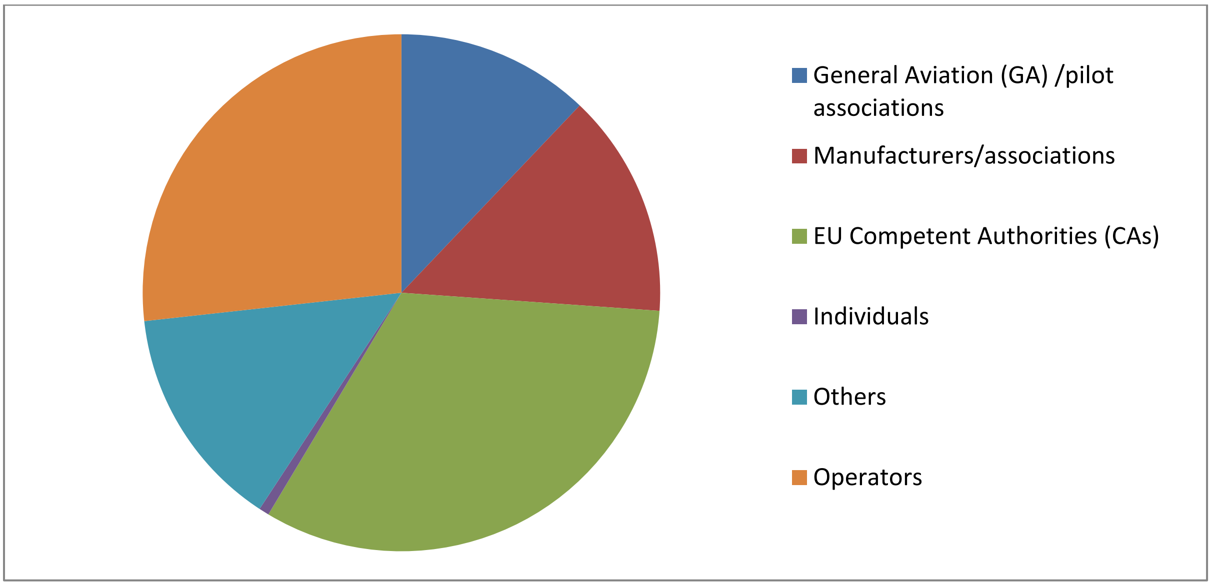

Figure 1: Comments received on NPA 2014-18

Out of the 26 commenters, 10 clearly expressed their support to the approach proposed by the NPA and only one commentator was opposed to the concept of CAT SET-IMC operations. Major concerns were raised in particular on the following topics:

— Use of a risk period: very diverse comments were received asking either for more stringent requirements related to the possible use of a risk period or for more flexibility in its implementation.

  Comments on the use of a risk period were addressed by proposing at AMC level a fixed 15-minute risk period limitation for each specific flight. This limitation could be extended based on a risk assessment performed by the operator for this specific flight. Additional GM provides guidance on the risk assessment methodology to be followed.

— Equipment requirements: comments were mainly focussing on the landing lights illumination capability requirement, on the navigation system requirement, and on the emergency power capacity requirement. No modification to the initial proposals was made following the comments received on these three items. It is, indeed, considered that:

  - based on test flights performed by Pilatus, the proposed landing lights illumination capability requirement is appropriate;
  - good airmanship should allow a flight crew to reach a selected landing site with the required current navigation system, provided that the flight was prepared in accordance with the procedure established by the operator; and

- the Pratt & Whitney Canada (PWC) database of accidents with an engine involvement was reviewed, indicating that, in all cases, a second restart attempt would not have helped due to the internal damages to the engine.

— Landing site selection: comments received were mostly asking for more criteria to be taken into account by operators when selecting landing sites along the route at the planning phase. To address these comments, a new GM has been drafted to provide some criteria to be considered by operators when assessing and selecting their landing sites.

— Crew training: comments received were recommending the use of Full Flight Simulators (FFSs) for the training on emergency procedures. It is agreed that, in any case, an FFS is the best means to train on such procedures while, at the same time, there are only very few FFSs available worldwide and almost none of them in Europe. Therefore, the related AMC/GM have been amended to mention that an FFS or a suitable FSTD should be used whenever one of them is available.

— Take-off minima: comments were asking for provisions for CAT SET-IMC operations to be defined in AMC1 CAT.OP.MPA.110 with regard to the determination of minimum take-off Runway Visual Range (RVR). It is acknowledged that take-off minima for CAT SET-IMC operations are currently missing in AMC1 CAT.OP.MPA.110 and, therefore, the draft AMC/GM, provided for information in this CRD, include a proposed amendment to AMC1 CAT.OP.MPA.110 to address this issue.

— Crew composition: comments were mostly asking for a minimum crew composition of two pilots for CAT SET-IMC operations. While it is agreed that a requirement for a second pilot is not appropriate for consistency reasons, since the possibly eligible aeroplanes are certified as single-pilot, and since light twins can currently be flown in IMC with one pilot, it is considered that the CAT SET-IMC environment might be challenging for an inexperienced pilot. Therefore, a new AMC has been drafted to set a minimum CAT SET-IMC operations' experience which should have been gained by pilots before being allowed to fly single-pilot aeroplanes in CAT SET-IMC operations.

— Safety Risk Assessment (SRA): As part of NPA 2014-18, a specific SRA for CAT SET-IMC operations had been developed. This material was appreciated by various commentators and provoked many comments, either questioning the methodology used, or proposing minor corrections or some improvements thereto. All these comments have been assessed, and a revised version of the SRA has been included in an Appendix to the Opinion.

In summary, 77 comments (i.e. 49 %) were accepted or partially accepted by the Agency, and 35 comments (i.e. 22 %) were noted since they were supportive of the NPA or the commentator had no comment on the proposals.

Only 45 (i.e. 29 %) of the comments received were not accepted.

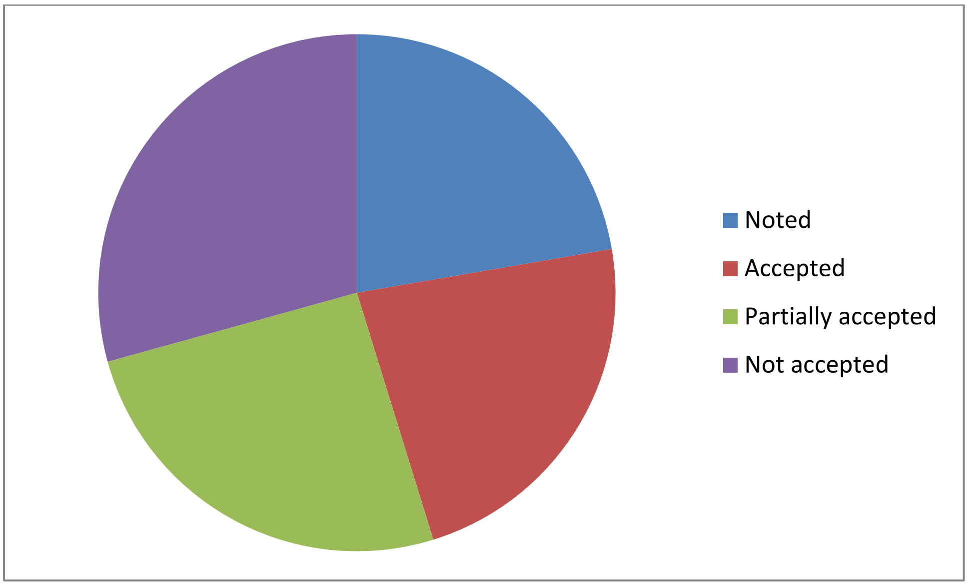

Figure 2: Repartition of the responses to the comments on NPA 2014-18

Individual answers to each one of the 157 comments received are contained in Chapter 4 of this CRD.

3. Draft Acceptable Means of Compliance and Guidance Material (Draft EASA Decision)

The text of the amendment is arranged to show deleted, new or amended text as shown below:

1. deleted text is shown with ~~strike through~~;
2. new or amended text is highlighted in grey;
3. an ellipsis (…) indicates that the remaining text is unchanged in front of or following the reflected amendment.

3.1 Proposed changes to AMC/GM (ED Decision 2014/025/R) to Annex II (Part-ARO) to Regulation (EU) No 965/2012

AMC3 ARO.OPS.200 Specific approval procedure

PROCEDURES FOR THE APPROVAL OF COMMERCIAL AIR TRANSPORT OPERATIONS WITH SINGLE-ENGINED TURBINE AEROPLANES IN IMC OR AT NIGHT (CAT SET-IMC)

(a) When verifying compliance with the applicable requirements of Annex V (Part-SPA), Subpart L (SET-IMC), the competent authority should check the operator's capability to safely carry out the intended operations in all proposed areas.

In addition, the competent authority should assess the operator's safety performance, experience and flight crew training, as reflected in the data provided by the operator with its application, to ensure that the intended safety level is achieved.

With regard to the operator's specific CAT SET-IMC flight crew training, the competent authority should ensure that it complies with the applicable requirements of Annex III (Part ORO), Subpart FC (FLICHT CREW) and Annex V (Part-SPA), Subpart L (SET-IMC), and that it is appropriate to the operations envisaged.

The competent authority should make an assessment of the operator's ability to achieve and maintain an acceptable level of propulsion system reliability. When the statistical assessment alone may not be applicable, eg. when the fleet size is small, the operator's performance should be reviewed on a case-by-case basis.

In the case of new operators without significant experience, the competent authority should at least assess the processes put in place by the operator to manage the safety of its operations.

(b) The competent authority may apply temporary restrictions to the operations (e.g. limitation to specific routes) until the operator can demonstrate that they master the operation to the satisfaction of the competent authority and in compliance with all requirements.

(c) When issuing the approval, the competent authority should specify:

(1) the particular airframe/engine combination;

(2) the identification of the individual aeroplanes designated for single-engined operations at night and/or in IMC by make, model and registration; and

(3) the authorised areas and/or routes of operation.

VALIDATION OF OPERATIONAL CAPABILITY

Observation by the competent authority of a validation flight, simulating the proposed operation in the aeroplane, should be carried out before an approval is granted. This should include flight planning and preflight procedures, as well as a demonstration of the following simulated emergency procedures at night in simulated IMC:

(a) total failure of the propulsion system; and

(b) total loss of normally generated electrical power.

In order to mitigate the risks associated with the conduct of such emergency procedures, the following should be ensured:

(a) the competent authority should assign appropriately qualified and experienced flight operations inspectors;

(b) suitable weather limits should be determined for the demonstration of the procedures involving higher risks;

(c) touch drills should be used for certain emergencies; and

(d) view-limiting devices (screes, hoods, etc.) should be used to simulate IMC.

CONTINUING SURVEILLANCE

Based on the operator's yearly reports and on the occurrences continuously reported by the operator, the competent authority should continuously monitor the operator's capability to maintain an acceptable level of propulsion system reliability and to appropriately manage any unexpected event which could endanger the safety of their operations. In the event that an acceptable level of reliability is not maintained, if significant adverse trends exist, or if significant deficiencies are detected in the conduct of CAT SET-IMC operations, the competent authority should impose operational restrictions if necessary, and stipulate corrective actions to be adopted by the operator in order to resolve the problems in a timely manner.

3.2 Proposed changes to AMC/GM (ED Decision 2014/017/R) to Annex III (Part ORO) to Regulation (EU) No 965/2012

GM3 ORO.GEN.130(b) Changes related to an AOC holder

CHANGES REQUIRING PRIOR APPROVAL

(...)

(s) commercial air transport operations with single-engined turbine aeroplanes in IMC or at night (CAT SET-IMC).

AMC1 ORO.GEN.160 Occurrence reporting

GENERAL

(...)

(c) In addition to the report required by Regulation (EU) No 376/2014, the operator approved in accordance with Annex V (Part-SPA), Subpart L (SET-IMC), should report any engine-related diversion or turnback during the operations, and all failures or events which could lead to loss of power.

AMC1 ORO.GEN.200(b) Management system

SIZE, NATURE AND COMPLEXITY OF THE ACTIVITY

(...)

(b) Operators with up to 20 FTEs involved in the activity subject to Regulation (EC) No 216/200814 and its Implementing Rules may also be considered complex based on an assessment of the following factors:

(1) in terms of complexity, the extent and scope of contracted activities subject to the approval;

(2) in terms of risk criteria, whether any of the following are present:

(i) operations requiring the following specific approvals: performance-based navigation (PBN), low visibility operation (LVO), extended range operations with two-engined aeroplanes (ETOPS), single-engined turbine aeroplane operations at night or in IMC (SET-IMC), helicopter hoist operation (HHO), helicopter emergency medical service (HEMS), night vision imaging system (NVIS) and dangerous goods (DG);

(...)

AMC3 ORO.MLR.100 Operations manual — general

CONTENTS — COMMERCIAL AIR TRANSPORT OPERATIONS

(...)

A GENERAL/BASIC

(...)

8 OPERATING PROCEDURES

(...)

8.1.13 For SET-IMC operations approved in accordance with Annex V (Part-SPA), Subpart L (SET-IMC):

(a) the procedure for route selection with respect to the availability of surfaces, that permits a safe forced landing;

(b) the instructions for the assessment of landing sites (elevation, landing direction, and obstacles in the area); and

(c) the instructions for the assessment of the weather conditions at these landing sites.

C ROUTE/ROLE/AREA AND AERODROME/OPERATING SITE INSTRUCTIONS AND INFORMATION

(...)

(2) Information related to landing sites available for operations approved in accordance with Annex V (Part-SPA), Subpart L (SET-IMC) including:

(a) a description of the landing site (position, surface, slope, elevation,etc.);

(b) the preferred landing direction; and

(c) obstacles in the area.

(...)

3.3 Proposed changes to AMC/GM (ED Decision 2014/015/R) to Annex IV (Part-CAT) to Regulation (EU) 965/2012

AMC1 CAT.OP.MPA.110 Aerodrome operating minima

TAKE-OFF OPERATIONS — AEROPLANES

(...)

(c) Required RVR/VIS — aeroplanes

(...)

(3) For single-engined aeroplane operations approved in accordance with Annex V (Part-SPA), Subpart L (SET-IMC), the take-off minima specified by the operator should be expressed as RVR/CMV (converted meteorological visibility) values not lower than those specified in Table 1.A below.

Unless the operator is making use of a risk period, whenever the surface in front of the runway does not allow for a safe forced landing, the RVR/CMV values should not be lower than 800 m. In this case, the proportion of the flight to be considered starts at the lift-off position and ends when the aeroplane is able to turn back and land on the runway in the opposite direction or to glide to the next landing site in case of power loss.

(~~3~~4) When RVR or meteorological visibility is not available, the commander should not commence take-off unless he/she can determine that the actual conditions satisfy the applicable take-off minima.

(...)

AMC1 CAT.IDE.A.235(c) Supplemental oxygen — pressurised aeroplanes

AEROPLANES WITHOUT AUTOMATIC DEPLOYABLE OXYGEN-DISPENSING UNITS

(a) For operations approved in accordance with Annex V (Part-SPA), Subpart L (SET-IMC) with aeroplanes, first issued with an individual CofA after 8 November 1998, operated at pressure altitudes at or below 25 000 ft and not fitted with automatic deployable oxygen-dispensing units, the flight crew should manage the descent in case of a loss of power in order to ensure that the cabin pressure altitude is not higher that 13 000 ft for more than four minutes.

(b) The operator should specify in the operations manual the aircraft capability in terms of cabin pressure leak rate in case of an engine power loss, as well as and the relevant procedures.

GM1 CAT.IDE.A.235(c) Supplemental oxygen — pressurised aeroplanes

AEROPLANES WITHOUT AUTOMATIC DEPLOYABLE OXYGEN-DISPENSING UNITS

For operations approved in accordance with Annex V (Part-SPA), Subpart L (SET-IMC), should a loss of engine power occur, it is required that sufficient supplemental oxygen for all occupants is available to allow descent from the maximum certified cruising altitude, performed at the best-range gliding speed and in the best gliding configuration, assuming the maximum cabin pressure leak rate, until an altitude of 13 000 ft or below is reached.

In the case of pressurised aeroplanes first issued with an individual CofA after 8 November 1998, with a maximum certificated cruising altitude above 25 000 ft and not fitted with automatically deployable oxygen-dispensing units, the amount of supplemental oxygen should be based on a cruising altitude of 25 000 ft as CAT.IDE.A.235(c) limits the operations of such aeroplanes to the aforementioned altitude.

For such single-engined turbine aeroplanes, with the energy source of the pressurisation system being lost (this is at least the case of pressurisation systems relying on a bleed air inflow), the cabin altitude will increase at a rate dependent upon the pressurisation system design and the cabin pressure leak rate.

Therefore, following an engine failure during such operations, the cabin altitude will remain below 13 000 ft for a certain duration, which should allow the flight crew to descend at the best gliding speed during this period.

The intent of the CAT.IDE.A.235(c) requirement is to ensure that this does not result in any unsafe conditions for the passengers as the cabin altitude might increase above 13 000 ft, while ensuring the safety of operations approved in accordance with Annex V (Part-SPA), Subpart L (SET-IMC) by maximising the chances of reaching an adequate landing site.

3.4 Proposed changes to AMC/GM (ED Decision 2012/019/R) to Annex V (Part-SPA) to Regulation (EU) No 965/2012

Subpart L — Single-engined turbine aeroplane operations at night or in Instrument Meteorological Conditions (IMC) (SET-IMC)

AMC1 SPA.SET-IMC.105 SET-IMC operations

ANNUAL REPORT

After obtaining the initial approval, the operator should make available to its competent authority on an annual basis a report related to its CAT SET-IMC operations containing at least the following information:

(a) the number of CAT SE-IMC flights operated;

(b) the number of CAT SET-IMC hours flown; and

(c) the number of occurrences sorted by type.

AMC1 SPA.SET-IMC.105(a) SET-IMC operations

TURBINE ENGINE RELIABILITY

(a) The operator should obtain the power plant reliability data from the Type Certificate Holder (TCH) and/or Supplemental Type Certificate (STC) holder.

(b) The data considered relevant and reliable for the engine-airframe combination should have demonstrated, or be likely to demonstrate, a rate of turbine engine in-flight shutdown, or power loss for all causes such that a forced landing is inevitable, of less than ten per million flight hours.

(c) The in-service experience of the intended airframe/engine combination should be at least 100 000 hours, demonstrating the required level of reliability. If this experience has not been accumulated, then, based on analysis or test, in-service experience for a similar or related type of airframe and turbine engine or other means might be considered by the TCH/STC holder to develop an equivalent safety argument in order to demonstrate that the reliability criteria are achievable.

AMC1 SPA.SET-IMC.105(b) SET-IMC operations

MAINTENANCE PROGRAMME

The following maintenance aspects should be addressed by the operator:

(a) Engine monitoring programme:

The operator’s maintenance programme should include an oil consumption monitoring programme. This should be based on engine manufacturer's recommendations, if available. The programme should contain provisions to monitor trends with reference to the running average consumption; i.e. the monitoring should be continuous and take account of the oil added. An engine oil analysis programme may also be required if recommended by the engine manufacturer. The opportunity to perform frequent (recorded) power checks on a calendar basis should be considered.

The engine monitoring programme should also provide for engine condition monitoring describing the parameters to be monitored, method of data collection and corrective action process and be based on the engine manufacturer's instructions. This monitoring will be used to detect propulsion system deterioration at an early stage allowing corrective action to be taken before safe operation is affected.

(b) Propulsion and associated systems’ reliability programme:

A propulsion and associated systems’ reliability programme should be established or the existing reliability programme supplemented for the particular engine/airframe combination. This programme should be designed to early identify and prevent problems, which otherwise would affect the ability of the aeroplane to safely perform its intended flight.

Where the single-engined night and/or IMC fleet is part of a larger fleet of the same airframe-engine combination, data from the operator's total fleet should be acceptable.

For engines, the programme should incorporate reporting procedures for all significant events. This information should be readily available (with the supporting data) for use by the operator, Type Certificate Holders (TCHs) and the competent authority to help establish that the reliability level set out in AMC1 SPA.SET-IMC.105(a) is achieved. Any adverse sustained trend would require an immediate evaluation to be completed by the operator in consultation with its competent authority. The evaluation may result in corrective actions or operational restrictions being applied.

The engine programme should include, as a minimum, the engine hours flown in the period, the power loss rate for all causes and the engine removal rate, both rates on an annual basis, as well as reports with the operational context focussing on critical events. These reports should be communicated to the TCH and to the competent authority.

The actual period selected should reflect the global utilisation and the relevance of the experience included (e.g. early data may not be relevant due to subsequent mandatory modifications which affected the power loss rate). After the introduction of a new engine variant and whilst global utilisation is relatively low, the total available experience may have to be used to try to achieve a statistically meaningful average.

AMC1 SPA.SET-IMC.105(c) SET-IMC operations

TRAINING PROGRAMME

The operator’s flight crew training and checking, established in accordance with ORO.FC, should incorporate the following elements:

(a) Conversion training
Conversion training should be conducted in accordance with a syllabus devised for the operation of single-engined aeroplanes at night and/or in IMC and include at least the following:

(1) normal procedures:

(i) anti- and de-icing systems operation;

(ii) navigation systems’ procedures;

(iii) radar positioning and vectoring, when available;

(iv) use of radio altimeter;

(v) use of fuel control, displays interpretation;

(2) abnormal procedures:

(i) anti- and de-icing system failures;

(ii) navigation system failures;

(iii) pressurisation system failures;

(iv) electrical system failures;

(v) engine-out descent in simulated IMC; and

(3) emergency procedures:

(i) engine failure shortly after take-off;

(ii) fuel system failures (e.g. fuel starvation);

(iii) engine failure other than above: recognition of failure, symptoms, type of failure, actions to be taken, and consequences;

(iv) depressurisation;

(v) engine restart procedures;

— choice of aerodrome or landing site; and
— use of area navigation system;

(vi) ATCO communications;

(vii) use of radar positioning and vectoring (when available);

(viii) use of radio altimeter; and

(ix) practice of the forced landing procedure to touchdown in simulated IMC, with zero thrust set, and operating with simulated emergency electrical power.

(b) Conversion checking

The following items should be checked following completion of the single-engined night and/or IMC operations conversion training as part of the operator’s proficiency check (OPC):

(1) conduct of the forced landing procedure to touchdown in simulated IMC, with zero thrust set, and operating with simulated emergency electrical power;

(2) engine restart procedures;

(3) depressurisation following engine failure; and

(4) engine-out descent in simulated IMC.

(c) Use of simulator (conversion training and checking)

Where a suitable Full Flight Simulator (FFS) or a suitable Flight Simulation Training Device (FSTD) is available, it should be used to carry out training on the items under (a) and checking of the items under (b) above for single-engined night and/or IMC operations conversion training and checking.

(d) Recurrent training

Recurrent training for single-engined night and/or IMC operations should be included in the recurrent training required by Annex III (Part-ORO), Subpart FC (FLIGHT CREW) for pilots carrying out single-engined night and/or IMC operations. This training should include all items under (a) above.

(e) Recurrent checking

The following items should be included into the list of required items to be checked following completion of single-engined night and/or IMC operations recurrent training as part of the operator's proficiency check (OPC):

(1) conduct of the forced landing procedure to touchdown in simulated IMC, with zero thrust set, and operating with simulated emergency electrical power;

(2) engine restart procedures;

(3) depressurisation following engine failure; and

(4) emergency descent in simulated IMC.

(f) Use of simulator (recurrent training and checking)

Following conversion training and checking, the next recurrent training session and the next operator's proficiency checks (OPCs) including single-engined night and/or IMC operations items should be conducted in a suitable FFS or FSTD, where available.

AMC2 SPA.SET-IMC.105(c) SET-IMC operations

CREW COMPOSITION

(a) In case of single-pilot operations, in addition to the requirements of ORO.FC.202, the pilot-in-command should have a minimum experience of 100 flight hours under IFR on the relevant type or class including LIFUS.

(b) A lesser number of flight hours under IFR may be acceptable to the competent authority when the flight crew member has significant previous IFR experience.

GM1 SPA.SET-IMC.105(c) SET-IMC operations

AVAILABILITY OF FFS OR FSTD

The availability of FFS or FSTD should be determined based on the criteria provided in Annex I (Part-FCL) to Regulation (EU) No 1178/2011.

AMC1 SPA.SET-IMC.105(d)(2) SET-IMC operations

FLIGHT PLANNING

(a) The operator should establish flight planning procedures to ensure that the routings and cruise altitude are selected so as to have a landing site within gliding range.

(b) Notwithstanding (a), whenever a landing site is not within gliding range, one or more risk periods may be used for the following operations:

(1) over water;

(2) over terrain which prevents a safe forced landing to be performed because the surface is inadequate;

(3) over congested areas; or

(4) over areas where occupants cannot be adequately protected from the elements, or where search and rescue response/capability are not provided pursuant to the anticipated exposure.

Except for the take-off and landing phase, the operator should ensure that when a risk period is planned, there is a possibility to glide to a non-congested area.

The total duration of the risk periods per flight should not exceed 15 minutes unless the operator has established, based on a risk assessment carried out for the route concerned, that the cumulative risk of fatal accident due to an engine failure for this flight remains at an acceptable level (see GM2 SPA.SET-IMC.105(d)(2)).

(c) The operator should establish criteria for the assessment of each new route. These criteria should address the following:

(1) The selection of aerodromes along the route.

(2) The identification and assessment of the continued acceptability of landing sites (obstacles, dimensions of the landing area, type of the surface, slope, etc.) along the route when no aerodrome is available.

Based on publicly available information, the operator should assess on a regular basis the accessibility of the landing sites identified for the routes operated. It is recommended to perform this assessment at least on a yearly basis in order to detect modifications to the landing sites which could prevent from conducting a safe forced landing (new buildings, ditches, barbed wires, etc.).

(3) Assessment of en-route specific weather conditions that could affect the capability of the aeroplane to reach the selected forced landing area following a loss of power (including the gliding descent through clouds in freezing conditions, icing conditions, headwinds, etc.);

(4) Consideration of landing sites' prevailing weather conditions to the extent that such information is available from local or other sources. Expected weather conditions at landing sites for which no weather information is available should be assessed and evaluated taking into account a combination of the following information:

(i) local observations;

(ii) regional weather information (e.g. significant weather charts); and

(iii) TAF/METAR of the nearest aerodromes.

(5) Protection of the aeroplanes occupants after landing in case of adverse weather.

(d) At the flight planning phase, any selected landing site should have been assessed by the operator as acceptable for carrying out a safe forced landing with a reasonable expectation of no injuries to persons in the aeroplane or on the surface. All information, that can be reasonably practical to acquire, should be used by the operator to establish the characteristics of landing sites;

(e) Landing sites suitable for a diversion or forced landing should be programmed into the navigation system so that track and distance to the landing sites are immediately and continuously available. None of these preprogrammed positions should be altered in flight.

AMC2 SPA.SET-IMC.105(d)(2) SET-IMC operations

ROUTE AND INSTRUMENT PROCEDURE SELECTION

The following provisions should be considered by the operator, as appropriate, depending on the use of a risk period:

(a) Departure

The operator should ensure, to the extent possible, that the instrument departure procedures to be followed are those guaranteeing that the flight path would allow, in the event of a power loss, the aeroplane to land on a landing site.

(b) Arrival

The operator should ensure, to the extent possible, that the only arrival procedures to be followed are those guaranteeing that the flight path would allow, in the event of a power loss, the aeroplane to land on a landing site.

(c) En Route

The operator should ensure that any planned or diversionary route should be selected and be flown at an altitude such that, in the event of a power loss, the pilot would be able to make a safe landing on a landing site.

GM1 SPA.SET-IMC.105(d)(2) SET-IMC operations

LANDING SITE

(a) A landing site is an aerodrome or an area where a safe forced landing can be performed by day or by night taking into account the expected weather conditions at the time of the foreseen landing.

(b) When assessing the acceptability of a landing site which is not an aerodrome, based on information which is readily available to the operator, it is recommended to consider the following landing site criteria:

(1) Size and shape of the landing area

A minimum width of 45 m is recommended for the landing area. The length of the landing site should allow the aeroplane to completely stop within the available surface, taking into account the slope and the type of the surface.

It is recommended to select, if possible, landing sites with a circle shape as they allow multiple approach paths depending on the wind.

(2) Longitudinal and lateral slope

The slope of the landing site should be assessed by the operator in order to determine its acceptability and possible landing directions.

(3) Obstacles

It is recommended that both ends of the landing area, or only the zone in front of the landing area for one-way landing areas, are clear of any obstacle which could represent a hazard during the landing phase.

(4) Type of ground surface

The ground surface of the landing area should allow a safe forced landing to be conducted.

(c) When selecting landing sites along a route to be operated, it is recommended to give the following priority to the different types of landing sites:

(1) aerodromes with available runway lighting;

(2) aerodromes without available runway lighting;

(3) non-populated fields with short grass/vegetation; or

(4) non-populated sandy areas.

GM2 SPA.SET-IMC.105(d)(2) SET-IMC operations

SAFETY RISK ASSESSMENT

(a) Introduction

The risk assessment methodology should aim at estimating for a specific flight the likelihood of having fatalities due to emergency landing caused by engine failure. Based on the outcome of this risk assessment, the operator may extend the duration of the risk period above the maximum allowed duration if no landing site is available within gliding range.

(b) The safety target

The overall concept of CAT SET-IMC operations is based on an engine reliability rate of 10 per million flight hours, which permits, in compliance with CAT SET-IMC requirements, an overall fatal accident rate for all causes of four per million flight hours.

Based on accident databases, it is considered that the engine failure event does not contribute by more than 33 % to the overall fatal accident rate. Therefore, the purpose of the risk assessment is to ensure that the probability for a specific flight of a fatal accident following an engine failure remains below the target fatal accident rate of $1{,}3 \times 10^{-6}$.

(c) Methodology

The methodology aims at estimating the likelihood of failing to achieve a successful forced landing in case of an engine failure, a successful forced landing being defined as a landing on an area for which it can reasonably be expected that this landing will not lead to serious injury or loss of life, even though the aeroplane may incur extensive damage.

This methodology consists of creating a risk profile for a specific route, including departure, en-route and arrival airfield and runway, by splitting the proposed flight into appropriate segments (based on the flight phase or the landing site selected), and by estimating the risk for each segment should the engine fail in one of these segments. This risk profile is considered to be an estimation of the probability of an unsuccessful forced landing if the engine fails during one of the identified segment.

When assessing the risk for each segment, the height of the aeroplane at which the engine failure occurs, the position relative to the departure or destination airfield or to an emergency landing site en route, and the likely ambient conditions (ceiling, visibility, wind and light) should be taken into account, as well as the standard operator's procedures (e.g. U-turn procedures after take-off, use of synthetic vision, descent path angle for standard descent from cruise altitude, etc.).

The duration of each segment determines the exposure time to the estimated risk. The risk is estimated through the following calculation:

Segment Risk Factor = segment exposure time (seconds)/3 600 X probability of unsuccessful forced landing in this segment X assumed engine failure rate per FH.

By summing the risks for all individual segments, the cumulative risk for the flight due to engine failure can be calculated and converted to risk on a 'per flight hour' basis.

This total risk must remain under the target fatal accident rate of 1,3 x 10^{-6}.as under (b) above.

d) Example of a risk assessment

An example of such a risk assessment is provided below. In any case, this risk assessment is an example designed for a specific flight with specific departure and arrival aerodromes' characteristics. It is an example on how to implement this methodology, and all the estimated probabilities used in this table cannot be directly transposed to any other flight.

The meaning of the different parameters used is further detailed below:

<u>AD/other:</u> 'AD' is ticked whenever only aerodromes are selected as landing sites in the segment concerned. 'Other' is ticked if the selected landing sites in the segment concerned are not aerodromes. When a risk period is used by the operator, none of the two boxes, AD/others, are ticked.

<u>Segment exposure time:</u> this parameter represents the duration of each segment in seconds.

<u>Estimated probability of unsuccessful forced landing if engine fails in the segment</u>: Probability of performing in the segment a safe forced landing following an engine power loss.

<u>Segment risk factor:</u> Risk of unsuccessful forced landing (because of a power loss) per segment (see formula above).

		LANDING SITE				Assumed engine failure rate per FH			1,00E-05
Segments of flight	**Assumed height or height band AGL- ft.**	**AD**	**Other**	**Segment exposure time (seconds)**	**Cumulative flight time from start of take-off to end of segment (seconds)**	**Estimated probability of unsuccessful forced landing if engine fails in this segment**	**Segment risk factor**	**Cumulative risk per flight**	**Comment on estimation of unsuccessful outcome**
Take-off ground roll	0 ft	X		20	20	0,01 %	5,56E-12	5,56E-12	T-O aborted before being airborne. Runway long enough to stop the aircraft.
Climb-out	0 to50 ft	X		8	28	0,10 %	2,22E-11	2,78E-11	Aircraft aborts T-O and lands ahead within runway length available
	50 to 200 ft	X		10	38	1,00 %	2,78E-10	3,06E-10	
	200 to 1 100 ft			36	74	100,00 %	1,00E-07	1,00E-07	Aircraft must land ahead outside airfield with little height to manoeuvre
	1 100 to 2 000 ft	X		36	110	50,00 %	5,00E-08	1,50E-07	U-turn and landing at opposite QFU possible.
	2 000 to 4 000 ft	X		80	190	25,00 %	5,56E-08	2,06E-07	
Climbing to en-route height.	4 000 to 10 000ft	X	X	240	430	5,00 %	3,33E-08	2,39E-07	Aircraft can operate a glide-in approach
Cruise: emergency area available	10 000 ft and above	X		5 400	5 830	5,00 %	7,50E-07	9,89E-07	En-route cruise time with available landing sites along the route within gliding range.
Cruise: emergency area NOT available	10 000 ft and above			300	6 130	100,00 %	8,33E-07	1,82E-06	En-route cruise time, without available landing sites within gliding range.

Descent to initial approach fix for IFR approach	10 000 down to 4 000 ft on a 4° slope (1 200 ft/min)	X		300	6 430	5,00 %	4,17E-08	1,86E-06	Descent with available landing sites within gliding range and destination not reachable.
Aircraft must descend below a glide approach capability to set up for a normal powered landing from 1 000 ft on a 3° approach path	4 000 down to 1 000 ft on the approach		X	150	6 580	50,00 %	2,08E-07	2,07E-06	Aircraft descends below the height needed to maintain a glide approach for reaching the airfield. Therefore, could land short of airfield if engine failed.
Aircraft descends on a 3° approach path	1 000 ft down to 50 ft on approach at 120 kt , 5 %, 600 ft/min			95	6 675	100,00 %	2,64E-07	2,34E-06	Assumes 3° glideslope, regained to ensure normal landing. Therefore, could land in the undershoot if the engine failed at this late stage.
Landing	50 ft above threshold to touchdown	X		10	6 685	5,00 %	1,39E-09	2,34E-06	Aircraft over runway. Engine is to be put to idle anyway, but failure, while airborne, could surprise pilot and result in hard landing.
Landing ground run	Touchdown to stop	X		15	6 700	0,01 %	4,17E-12	2,34E-06	Aircraft on ground. Risk, if engine stops on the example runway (very long), negligible, providing all services retained
								1,26E-06	Risk per flight

The following likelihood scale may be used to determine the estimated probability of an unsuccessful safe forced landing:

Probability in %	**Description**
0	Impossible
0 to 1	Negligible likelihood/Remote possibility
1 to 10	Possible but not likely
10 to 35	Moderately likely
35 to 65	Possible
65 to 90	Likely
90 to 99	Almost certain
99 to 100	Certain

AMC1 SPA.SET-IMC.105(d)(3) SET-IMC operations

CONTINGENCY PROCEDURES

When a risk period is used during the take-off or landing phase, the contingency procedures should include appropriate information to the crew on the path to be followed after an engine failure in order to minimise, to the greatest extent possible, the risk for people on the ground.

AMC1 SPA.SET-IMC.110(b) Additional equipment requirements for SET-IMC operations

ATTITUDE INDICATOR

A backup or standby attitude indicator built in the glass cockpit installations is an acceptable means of compliance for the second attitude indicator.

AMC1 SPA.SET-IMC.110(d) Additional equipment requirements for SET-IMC operation

AIRBORNE WEATHER-DETECTING EQUIPMENT

The airborne weather-detecting equipment should be an airborne weather radar as defined in the applicable CS-ETSO issued by the Agency, or equivalent.

AMC1 SPA.SET-IMC.110(f) Additional equipment requirements for SET-IMC operations

AREA NAVIGATION SYSTEM

The area navigation system should be based on a Global Navigation Satellite System (GNSS) stand-alone receiver or multi-sensor system including at least one GNSS sensor in order to conduct at least Required Navigation Performance (RNP) Approach (RNP APCH) operations without vertical guidance.

GM1 SPA.SET-IMC.110(f) Additional equipment requirements for SET-IMC operations

AREA NAVIGATION SYSTEM

An acceptable standard for the area navigation system is ETSO-145/146c, ETSO-C129a, ETSO-C196a or ETSO-C115 issued by the Agency, or equivalent.

GM1 SPA.SET-IMC.110(h) Additional equipment requirements for SET-IMC operations

LANDING LIGHT

In order to demonstrate the compliance of its aeroplane's landing lights with the 200 ft illumination capability requirement, and in the absence of relevant data available in the AFM, the operator should liaise with the Type Certificate Holder (TCH) or Supplemental Type Certificate (STC) holder, as applicable, to obtain a statement of conformity.

GM1 SPA.SET-IMC.110(i)(7) Additional equipment requirements for SET-IMC operations

ELEMENTS AFFECTING PILOT'S VISION FOR LANDING

Examples of elements affecting pilot's vision for landing are rain, ice and window fogging.

AMC1 SPA.SET-IMC.110(l) Additional equipment requirements for SET-IMC operations

EMERGENCY ENGINE POWER CONTROL DEVICE

The means that allows continuing operation of the engine within a sufficient power range for the flight to be safely completed in the event of any reasonably probable failure/malfunction of the fuel control unit should enable the fuel flow modulation.

4. Individual comments (and responses)

In responding to comments, a standard terminology has been applied to attest the Agency's position. This terminology is as follows:

(a) **Accepted** — The Agency agrees with the comment and any proposed amendment is wholly transferred to the revised text.

(b) **Partially accepted** — The Agency either agrees partially with the comment, or agrees with it but the proposed amendment is only partially transferred to the revised text.

(c) **Noted** — The Agency acknowledges the comment but no change to the existing text is considered necessary.

(d) **Not accepted** — The comment or proposed amendment is not shared by the Agency.

(General Comments)	-

comment	*1* comment by: *Swiss International Airlines / Bruno Pfister* Swiss Intl Air Lines Ltd takes note of NPA 2014-18 without further comments.
response	Noted.

comment	*8* comment by: *Pilatus* Pilatus welcomes the intent by EASA to finally embrace the subject and take it to a successful conclusion and would like to see the process completed as soon as possible in order to facilitate SET CAT at the earliest opportunity.
response	Noted.

comment	*33* comment by: *Swedish Transport Agency, Civil Aviation Department (Transportstyrelsen, Luftfartsavdelningen)* ORO.FC.200 <u>Original text:</u> ORO.FC.200 Composition of flight crew (c) Specific requirements for aeroplane operations under instrument flight rules (IFR) or at night. (1) The minimum flight crew shall be two pilots for all turbo-propeller aeroplanes with a

maximum operational passenger seating configuration (MOPSC) of more than nine and all turbojet aeroplanes.

(2) Aeroplanes other than those covered by (c)(1) shall be operated with a minimum crew of two pilots, unless the requirements of ORO.FC.202 are complied with, in which case they may be operated by a single pilot.

Suggested text:

ORO.FC.200 Composition of flight crew

(c) Specific requirements for aeroplane operations under instrument flight rules (IFR) or at night.

(1) The minimum flight crew shall be two pilots for all turbo-propeller aeroplanes with a maximum operational passenger seating configuration (MOPSC) of more than nine, all turbo-propeller single-engine aeroplanes in passenger operations approved by the competent authority in accordance with Annex V (Part-SPA), Subpart L (SET-IMC) and all turbojet aeroplanes.

(2) Aeroplanes other than those covered by (c)(1) shall be operated with a minimum crew of two pilots, unless the requirements of ORO.FC.202 are complied with, in which case they may be operated by a single pilot.

Discussion:

Single-engine turboprop commercial operations can be high risk operations due to the consequences if the engine fails. Before allowing single-engine commercial operations, risk mitigations in regulations has to be considered.

Sweden has had single-engine cargo operations for more than a decade. During this time, one accident has occurred. Normally the operation was performed by two pilots, but in the case with the accident, single pilot operation was in place. This is one reason why Sweden is reluctant to single-pilot commercial operations with SET-IMC.

Regarding the risk assessment in the NPA. The NPA has considered statistics showing no positive effect of a second pilot and therefore suggests no additional regulations to ORO.FC.200. This has to be reviewed with the general knowledge in aviation of multi-pilot systems. Two pilots instead of one will reduce the possibility of occurrence of incidents. When a serious situation arise it is more likely to be identified and handled correctly by two pilots instead of one. Sweden has serious incidents investigated by the Swedish AIB, i.e. RL 2007:12, where a positive outcome has been a result of multi-pilot cooperation.

At present there are no conclusive statistics about the barriers that have prevented a negative outcome of an accident or serious incident, but in commercial aviation the multi-pilot concept is well accepted as a major risk mitigator. This needs to be considered when allowing a single-engine operation since in a worst case scenario it will be a dire task to land power off on a landing site without lights. The aid of a second pilot could make the difference.

In case that SET-IMC is accepted, there should be considerations about flying with

	passengers. This is about risk mitigations for fatalities. <u>Conclusion:</u> The Swedish Transport Agency would like to see that ORO.FC.200 is revised so that single-pilot operations are not allowed for SET-IMC-passenger operations.
response	Partially accepted. As indicated in the Explanatory Note to NPA 2014-18, the fatal accidents database for SET aircraft with engine involvement was reviewed and it was concluded that in almost all cases a second pilot would not have helped. One of the main cause identified was related to the lack of flight preparation, leaving the flight crew insufficiently prepared to manage an emergency situation following a power loss. However, the Agency acknowledges that while a requirement for a second pilot is not in general appropriate (aircraft single-pilot certified, consistency with the light twins' possibility to be operated in CAT with one pilot in IFR), in the case of flight crew with limited experience of such operations, a second pilot could provide an efficient mitigation to manage the additional workload and pressure. The resulting text of SPA.SET-IMC. 105 has been amended to include experience criteria for flight crew for single-pilot operations.

comment	*34* comment by: *Swedish Transport Agency, Civil Aviation Department (Transportstyrelsen, Luftfartsavdelningen)* AMC 1 CAT.OP.MPA.110 <u>Original text:</u> AMC 1 CAT.OP.MPA.110 (c) Required RVR/VIS — aeroplanes (1)... (2)... (3)... <u>Suggested text:</u> A new AMC AMC 1 CAT.OP.MPA.110 (c) Required RVR/VIS — aeroplanes (1)... (2)... (3)...

	(4) For turbo-propeller single-engine aeroplanes operations approved by the competent authority in accordance with Annex V (Part-SPA), Subpart L (SET-IMC), there is a need to re-land immediately and to see and avoid obstacles in the take-off area. The RVR minima used should not be lower than 800 meters for cargo operations and 1200 meters for passenger operations. Discussion: RVR and visibility have been discussed in the EASA workgroup, but since no suggestion about including this type of operation in CAT.OP.MPA.110, the Swedish Transport Agency suggests that a new AMC is added to AMC1 CAT.OP.MPA.110, (4). Today Sweden has a cargo SE-IMC operator that uses 800 meters of RVR/VIS for take-off and given the outcome and also looking at the calculated example in NPA 2014-18, an RVR/VIS of 800 meters is sufficient for cargo operations. For passenger operations it is suggested that the RVR/VIS should be 1200 meters in order to increase mitigations and reduce risk of fatalities. Conclusion: An AMC should be added with RVR/VIS requirements for SET-IMC. The RVR/VIS should be 800 meters for cargo and 1200 meters for passenger operations.
response	Partially accepted The Agency acknowledges that there were no specific provisions in NPA 2014-18 related to take-off minima for CAT SET-IMC operations. It should be noted that Regulation (EU) No 965/2015 does not make any differentiation between cargo or passengers operations. Taking into consideration the reliability of the engine concerned, the Agency considers that a minimum Runway Visual Range (RVR) value of 800 m is appropriate for CAT SET-IMC operations, in comparison to the higher RVR requirement for multi-engined aeroplanes which may need to reland immediately in the event of a critical engine failure during take-off (up to 1500 m depending on the height at which the engine failure occurs). An amendment to AMC1 CAT.OP.MPA.110 to reflect this has been introduced in the draft AMC and GM provided in this CRD.

comment	*35* comment by: *Swedish Transport Agency, Civil Aviation Department (Transportstyrelsen, Luftfartsavdelningen)* EASA should consider the need to revise the CS-GEN-MMEL-regulations with SET-IMC in mind.
response	Noted. The Agency will assess the need to revise CS-GEN-MMEL in its next revision.

comment	*44* comment by: *ECOGAS/SVFB/SAMA* **ECOGAS** Is deligthed, that the long standing subject is taken up and as we have been informed by consulted experts competent in the matter, the NPA is seen as base for a good regulation. We will concentrate on soft issues within this NPA which we feel is based on very valuable data and analyses, which we rate exemplary within the many NPA's we have seen.
response	Noted

comment	*57* comment by: *Federal Office of Civil Aviation, FOCA, Switzerland* The Federal Office of Civil Aviation (FOCA) of Switzerland fully supports the content of this NPA.
response	Noted

comment	*59* comment by: *Swedish Transport Agency, Civil Aviation Department (Transportstyrelsen, Luftfartsavdelningen)* AMC1 ORO.GEN.200(b) Management system EASA should consider the need to revise the list of complex or non-complex operations with SET-IMC in mind.
response	Accepted. AMC1 ORO.GEN.200(b) has been amended in the draft resulting text to include SPA.SET-IMC approvals in the criteria to be considered when determining if an organisation should be considered complex.

comment	*62* comment by: *CAA-NL* In former JAA times the NL always opposed the introduction of SET-IMC as we are a very densely populated country full of buildings, also in the countryside where fields are often divided by barbed wires. However we are in principle in favour of aligning the European regulations with the ICAO SARPS and will not oppose this NPA. Still we have some detailed comments we will give at the related paragraphs
response	Noted

comment	*80*	comment by: *Aero-Club of Switzerland*
	European Powered Flying Union (EPFU) and Aero-Club of Switzerland joined forces to submit this general comment on the, in our opinion, long overdue, NPA 2104-18, at the same time thanking the Agency for the preparation of th texts. We support Option 3 for the following reasons: It is a matter of a level playing field, as some Member States allow such operations, under varying conditions, this situation is to be changed. CAT operations with SET in IMC are safe in our view. The proposed risk mitigation measures are sufficient, considering turbo-prop engines reliability and what up-to-date navigation systems deliver. Introducing CAT with SET in IMC after nearly 10 years (ICAO authorises it since 2005) solves a harmonisation problem, FAA, TCCA and others are well ahead, it is high time to follow the more advanced competent authorities to at last offer the level playing field we still are looking for, also in other areas. It is also an environmental issue, looking at fuel consumption, noise footprints, two elements clearly supporting the CAT with SET in IMC business case. In areas with low traffic density, or where other means of transport do not offer adequate service, aircraft like PC-12, the TBM series or Cessna's Caravan family offer good solutions at reasonable costs. In the end, it is not only a commercial or technical topic: CAT with SET in IMC is to a high degree a social topic as well: Many remote places can be reached by air, provided these operations are at last allowed, when speed and independance from ground infrastructure is needed. It is an important service to people living and working in remote areas, many time under harsh environmental conditions.To have CAT with SET in IMC available is therefore, not only an aspect aircraft operations, but also one of services to the community living in remote areas. This social aspect should be stressed, in our view.	
response	Noted	

comment	*82*	comment by: *On behalf of Highlands and Islands Airports Ltd*
	Highlands and Islands Airports Ltd (HIAL) supports this proposed rule change as it will introduce the possibility for new aircraft to be considered to enhance existing routes or develop new ones economically where air services form a key part of the local transport network but demand levels may be relatively low.	
response	Noted	

comment | 95 | comment by: *UK CAA*

Page No: General comment

Paragraph No: Various

Comment: The proposals refer to "primary systems" (page 9 paragraph 9, 14 paragraph 2 and page 18 paragraph 3). However, there is no definition of "primary systems" within the referenced regulations.

Justification: It would be helpful if a definition of "primary systems" is included, to ensure the intended scope of 'primary systems reliability programme' is covered.

response | Accepted.

A new GM defining what is meant by 'primary systems' has been created and added to the draft resulting text.

comment | *106* | comment by: *Austro Control*

Reference: SPA.SET-IMC.105 (d)

Comment: Operating procedures should be extended to the items below.

Justification: For other SPA, the required operating procedures are specified in more detail than SPA.SET-IMC. in this NPA. The reason therefore is not clear and does not seem logical.

Proposal: Change text to:

Operating procedures have been established specifying (...):

4) Normal procedures

5) Contingency procedures

6) Monitoring and incident reporting;

Reference: SPA.SET-IMC.105 (a)

Comment: The engine reliability data does not take into account the cycles/hours and quality of overhaul on any of the engines that have failed.

Justification: All parameters relevant to engine data should be included in the application to provide the Authority with sufficient evidenve before approving SET-IMC.

Proposal: Change text to:

(...) the operator shall provide evidence that:

(a) an acceptable level of turbine engine reliability can be or has been achieved in service by the world fleet for the particular airframe-engine combination, including reliability data on

	cycles/hours and and quality of overhaul on any of the engines that have failed. **Reference: AMC1 SPA.SET-IMC.105 (c)** **Comment:** The use of a simulator for conversion and recurrent training should not be recommended, but mandatory whenever a simulator (FFS or FTD) is available. **Justification:** Due to the higher risk of single-engine night and IMC operations, EASA should tighten the regulations on this subject and not only recommend the use of a flight simulator, but should prescribe its use in the rule rather than the AMC. The higher risk includes the fact that during an emergency related to engine problems, the pilot in a single-engine turbine aeroplane as less time to react and and therefore should be trained as good as possible. The training in a FFS is considered to be the best preparation for emergencies. **Proposal:** Change text as follows and transform AMC1 SPA.SET-IMC.105 (c) into hard law: *(b) Use of simulator (conversion training):* *(1) Whenever readily available, a full flight simulator (FFS) ~~may~~ should be used to carry out training in the items required in (a) above for single-engine night and/or IMC conversion training;* *(2) Whenever readily available, a flight training device (FTD) ~~may~~ should be used to carry out training in normal procedures specified in (a)(1) above.* *(...)* *(d) Use of simulator (checking)* *Whenever readily available, a full flight simulator (FFS) ~~may~~ should be used to carry out checking for the items required in (c) above for single-engine night and/or IMC conversion checking.* *(...)* *(f) Use of simulator (recurrent training)* *(...) Thereafter, recurrent training should be carried out in a full flight simulator, whenever such is readily available.* *(...)* *(h) Use of simulator (recurrent checking)* *(...) Thereafter, single-engine night and/or IMC OPCs should be carried out in a full flight simulator, whenever such is readily available.* **Reference: AMC1 SPA.SET-IMC.105 (d)(2)** **Comment:** Point (b)(3) should be deleted to decrease the risk over congested areas **Justification:** Point (b)(3) should be deleted to decrease the risk over congested area **Proposal:** Delete (b)(3)
response	Partially accepted.

	— The resulting text of SPA.SET-IMC.105(d) has been modified accordingly. — The amendment to SPA.SET-IMC.105(a) has not been transposed as it is considered unrealistic and unpractical. — AMC1 SPA.SET-IMC.105(c) has been modified accordingly. — A new AMC1 SPA.SET-IMC.105(d)(3) has been introduced into the draft resulting text to indicate that when a risk period is used over congested areas during take-off and landing, a path should be defined at the planning phase to minimise the risk for people on the ground.

comment	*123* comment by: *Anthony Wassell* My comment is: As one-time Chairman of the JAA SE-IMC Working Group, I congratulate EASA on progressing an NPA which the JAA itself was unable to implement as a regulation. The inconsistency between allowing light piston powered twins to operate in IMC and at night while disallowing SE-IMC when both have equivalent accident rates is unbelievable. SE-IMC should be allowed, with the restrictions imposed in the NPA, so that new routes and types of business can be explored. A B Wassell
response	Noted.

comment	*144* comment by: *Luftfahrt-Bundesamt* LBA - General Comment on NPA 2014-18 - Commercial air transport aeroplane operations at night or in IMC using single-engined turbine aeroplane LBA herewith would like to express disagreement to allow the commercial operations under IMC with single-engined (S/E-) aeroplanes. In this context, we would also like to refer to our comments made in the corresponding JAA-NPAs, as, in essence, the intent of NPA 2014-18 does not differ from the corresponding JAA-proposals. The compensating measures to reduce the risk of engine failures and additional requirements to deal with the consequences of that event (power loss / engine and system failure) are in contradiction to the current rule system (performance factors for take-off and landing, equipment and training requirements, etc.). Being aware of such implications, it will be difficult to explain operators of aeroplanes with two turboprop-engines to comply with the current performance rules. One could argue, that, once an operator of such aircraft would apply the (additional) engine-maintenance and monitoring requirements of the NPA 2014-18, this operator could be alleviated from the

	current performance rules, as the engines of his aircraft are considered as reliable as those of S/E-turboprops, falling under the future NPA rules. As Europe is a rather populated area, where the possibility to perform a safe forced landing is rather low, the entire compensating system is anyhow questionable and politically difficult to justify, especially once an accident did happen. Should the NPA be adopted generally, we would like to provide technical observations: · We feel that maintenance requirements should not be placed in the operational rules and should be therefore moved to Part M. · The validations flights to be performed by ARO.OPS.200 and AMCs 3, are considered unsafe. · The requirements in paragraph (a) of AMC 1 SPA.SET-IMC 105 (c) can only be performed safely in a simulator / FNPT and not in the aircraft! · The requirements in paragraph a of AMC 1 SPA.SET-IMC 105 (d) (2) are not acceptable (SMS). · The requirements in paragraph a of AMC 2 SPA.SET-IMC 105 (d) (2) are not clear. What is meant by “a reasonable expectations of injuries?” This has nothing to do with operational rules. · The requirements in paragraph a of AMC 3 SPA.SET-IMC 105 (d)(2) are unclear as regards the development of Part C of the OM for such flight.
response	Partially accepted. — In any case, NPA 2014-18 was neither introducing nor suggesting any alleviation regarding performance requirements for two-engined aeroplanes. The current requirements for such aeroplanes remain unchanged. — The issue of population density has been addressed in the Explanatory Notes to NPA 2014-18 with a parallel document drawn in USA and Canada, which presents very similar figures. Please refer to this document for further rationales. — Maintenance considerations are already part of other SPA requirements in Regulation (EU) No 965/2012 as in any case Annex I (Part-M) to Regulation (EU) No 1321/2014 does not consider specific types of operations. — Some additional requirements have been introduced in the draft resulting text to ensure the safety of validation flights. — The wording of the related AMC has been amended to clearly state that when a simulator is available, it should be used for the training. — Operators are responsible to assess the risks of their operations and mitigate those risks in order to keep them at an acceptable level. This procedure is one possible mitigation of the consequences of having an engine failure. — The ‘safe forced landing’ definition (to which the ‘reasonable expectation of injuries’ is

linked) is already contained in Annex I (Definitions) to Regulation (EU) No 965/2012 as this concept is already used for several types of operations including CAT VFR single-engined aeroplane operations.

— This AMC is only intended to ensure that the most appropriate SID available is used, to the extent possible, for CAT SET-IMC operations.

comment	*153* comment by: *EUROCONTROL* The EUROCONTROL Agency does not have comments on NPA 2014-18.
response	Noted.

2. Explanatory Note — 2.1. Overview of the issues to be addressed p. 6

comment	*36* comment by: *IAOPA Europe* IAOPA finds the NPA a very big step forward for commercial General Aviation, since it opens up a whole new field of operation for this type aircraft. We believe that specifically more remote destinations by this initiative will become profitable to serve with commercial flying with great benefit for those regions. We also believe that the proposed regulation for both maintenance and operations is in general adequate to ensure the safe operation under these conditions. IAOPA finds it especially important that the proposed regulation accepts a procedure for the operator to determine a random route selection and landing sites and thereby allowing full flexibility under safe conditions. IAOPA supports the ongoing work towards Commercial air transport at night or in IMC using single-engined turbine aeroplane.
response	Noted.

comment	*45* comment by: *ECOGAS/SVFB/SAMA* Issues to be adressed. While we are not competent to analyse to the technical details of the issues adressed, we support the principles given in the overview:

	- alignment with ICAO - risk based approach by refering to data - economical considerations
response	Noted.

comment	*96* comment by: *UK CAA* **Page No:** 6 **Paragraph No:** 2.1 Overview of the issues to be addressed. **Comment:** Paragraph 2.1 suggests that SET-IMC can be justified by the fact that there are some routes which can only be operated by single engined aeroplanes, due to performance constraints, physical aerodrome limitations where the local infrastructure is remote and limited and there are no viable alternative modes of transport. These are the criteria for public service obligation services, for which this proposal is best suited **Justification:** The need for a level playing field between Member States is understood, but in the context of the small number of SET-IMC operators, the safety case for expanding SET-IMC operations has not been made using the target level of safety that has the achieved fatal accident rate (3.96 per million flight hours) for light twin turboprop aeroplanes. We would suggest that this is set in line with the current certification requirements, i.e. 1 per million flight hours for this class of aircraft.
response	Not accepted. In any case, operational safety targets cannot be compared to the certification safety target, as the latter encompasses many other parameters, and, as a consequence, they are always higher.

2. Explanatory Note — 2.2. Objectives p. 6

comment	*97* comment by: *UK CAA* **Page No:** 6 **Paragraph No:** 2.2 objectives, second sub-paragraph **Comment:** It is understood that the overall intent means that such operations would include both national and international capability, compliant with obligations under ICAO. Whilst the objective is clearly stated in Section 2.2, the RIA in Section 4 does not clearly

	address how other aspects of the design/certification process has considered the associated hazards and risk management considerations. It is not practical to propose the necessary changes to the extent required. It is therefore proposed that the working group consider the implications and amend the RIA proposal to clarify intent and better explain/justify the reasoning of how the documented approach is aligned with the type certification process, and how the proposed assessment should be used by national airworthiness authorities. Further comments are offered against specific page/paragraphs to provide more detailed comments against the assessment process as documented and how the CAA understands the type certification process deals with risk assessment, safety targets and compliance demonstration. **Justification:** It is considered appropriate that the risk assessment should be clearly aligned with what has been considered and demonstrated within the initial type certification safety assessment process, and as far as practicable, the established safety process to be used to ensure that aircraft capability is suitable for the intended operational environment. Thereafter the risk based assessment processes such as described in this NPA, that includes local environmental factors etc. should be able to be used by the local airworthiness authority.
response	Not accepted. CAT SET-IMC operation's capability is not subject to a specific airworthiness certification as such aeroplanes are already certified in accordance with appropriate certification standards. In any case, operational safety targets cannot be compared to the certification safety target, as the latter encompasses many other parameters, and, as a consequence, they are always higher.

comment	*155* comment by: *General Aviation Manufacturers Association / Hennig* GAMA notes that EASA has appropriately clarified the applicability of this rulemaking in 2.2 Objectives. The NPA is titled Commercial air transportation aeroplane operations at night or in IMC using single engine turboprop aeroplane. Section 2.2, however, properly captures the scope of this rulemaking. The rulemaking is applicable for "single-engine turbine aeroplanes" and the operations may be conducted at night "and/or" in IMC. GAMA supports this clarification by the agency.
response	Noted.

2. Explanatory Note — 2.3. Summary of the RIA p. 6-8

comment	*46* comment by: *ECOGAS/SVFB/SAMA* We appreciate that option 3 takes into consideration economic aspects and shifting responsibility to the operator's , crediting him for a working management system.
response	Noted.

comment	*83* comment by: *On behalf of Highlands and Islands Airports Ltd* HIAL supports the selection of Option 3 as the most appropriate and practical option.
response	Noted.

comment	*143* comment by: *Glass Eels Ltd* **Comment:** The safety, environmental, social, economic and regulatory impacts are all dealt with in a qualitative manner. Although this is thought to lead generally to the correct conclusion, a more satisfactory approach would have been to quantify the benefits and disbenefits in terms of cost including a measure of the value of a life. Examples of this approach may be found through out the work of the NTSB. The value of such an approach is that it enables the difficult questions at the margins of the debate to be evaluated on a quantitative and rational basis. It will be seen later in that this type of cost analysis would have had an important contribution to understanding the merits of the 15 minute risk period. **Proposed Text:** Nil
response	Not accepted. The Agency has a different policy for the establishment of its Regulatory Impact Assessment (RIA) compared to other regulators, and relies only on this Multi-Criteria Analysis (MCA).

3. Proposed amendments — Regulation (EU) No 965/2012 — Cover Regulation p. 11

comment | *22* | comment by: *DGAC France*

Paragraph 3.1 (page 11) proposes changes to the AIR OPS cover regulation.

Paragraph 5 of article 6 allowing derogations for CAT operations with single engine aeroplanes is deleted.

Provisions are introduced for SET operations in IMC or at night

Entry into force is soon after publication of the rgulation (20 days) and application 1 year after.

We understand that the only way it can work is the following :

1. operators who have already been granted a derogation to operate SET in IMC or at night will have to comply with the new provisions 1 year after into force at the latest

2. operators who have not been granted any derogation to operate SET in IMC or at night will have to comply with the new provisions as soon as it enters into force.

Confirmation would be appreciated

response

Accepted.

The draft Cover Regulation has been amended to introduce some transitional provisions.

3. Proposed amendments — Regulation (EU) No 965/2012 — Part-CAT p. 12

comment | *37* | comment by: *IAOPA Europe*

Why does this NPA take influence on the operation of twin engine aircraft under CAT.POL.A300?
"The operator shall treat two-engined aeroplanes that do not meet the climb requirements of CAT.POL.A.340 as single-engined aeroplanes."

No rationale is given for this position. As new regulation should be risk-based and supported by data under the new GA Roadmap we can´t accept this proposed change.

response

Not accepted.

This text is already part of Regulation (EU) No 965/2012, and no proposal for an amendment was contained in NPA2014-18.

3. Proposed amendments — Regulation (EU) No 965/2012 — Part-CAT — CAT.OP.MPA.136 p. 12

comment

9 comment by: *Pilatus*

In the proposed guidance material (AMC1 SPA.SET-IMC.105(d)(2), it is stated that risk periods of no more than 15 minutes may be determined. It might be worth incorporating the 15 minute clause in the basic rule to avoid misinterpretation.

response

Not accepted.

The intent of having the 15-min criteria at an AMC level is to provide more flexibility to operators since a deviation from this requirement would have to follow the AltMOC process while a deviation from an Implementing Rule (IR) would have to follow the Article 14 process which is much more complex.

comment

61 comment by: *General Aviation Manufacturers Association / Hennig*

EASA proposes in AMC1 SPA.SET-IMC.105(d)(2) SET IMC operations FLIGHT PLANNING that an allowance for "one or more risk periods of no more than a total of 15 minutes per flight may be determined whenever a landing site is not within gliding range and for the following operations".

GAMA supports the allowance of a risk period to provide for a straight forward way to conduct flight planning and fully leverage existing navigational capabilities including procedures, such as SID and STAR, to improve traffic flow and manage safety.

To ensure consistent use of the 15 minute risk period within Member States, GAMA also recommends that EASA explore promoting the 15 minute allowance from AMC into the regulation. As an example, could the 15 minute allowance be identified in CAT.OP.MPA.136?

response

Not accepted.

The intent of having the 15-min criteria at an AMC level is to provide more flexibility to operators since a deviation from this requirement would have to follow the AltMOC process while a deviation from an Implementing Rule (IR) would have to follow the Article 14 process which is much more complex.

comment	*69*	comment by: *Daniel HUNN*
	The lack of a definition of 'surface' is a serious concern. Given that many of these will be 'uncontrolled' areas, their characteristics and freedom from obstacles can change, completely unnoticed at any time. It is accepted that this type of operation is likely to be used in situations which would not be commercially viable any other in way. Therefore, by definition, these will be commercially marginal operations. As such, there will be much pressure to operate at all costs; this could easily lead to situations where the operator selects 'surfaces' which are not appropriate. Furthermore, many of these 'off-airfield' sites will require a particular direction of landing which may be precluded by the wind direction and strength on the day.	
response	Partially accepted. Some guidance has been introduced in the draft resulting text to provide information to the operator on the criteria to be considered when assessing a landing site.	

comment	*85*	comment by: *Nordflyg*
	ICAO annex 6 Chapter 5, 5.4 Note 2. implies that there is no need to take into consideration the availability of forced landing areas at all points along a route (except for routes over water which is regulated in Attachment 1*, supplementary to Chapter 5, 5.4 and Appendix 3*) for aeroplanes and operators approved according to chapter 5, 5.4. The operator has already mitigated the associated risks with single engine IMC operations by implementing a trend monitoring program, special training for crews, special SOP, survival equipment suitable for the type of operation, engine type reliability, etc. so the need for establishing safe forced landing areas along routes over land should not apply.	
response	Not accepted. While the Agency recognises that ICAO Annex 6 does not require a safe forced landing area to be available along the route, it is considered that the proposed requirement provides an appropriate mitigation in case of a power loss. In any case, in order to provide more flexibility to operators, a possibility to extend the risk period is provided, based on a risk assessment to be established by them for the specific route concerned.	

comment	*124*	comment by: *Nigel Johnstone*
	Surfaces to permit a safe landing CAT.OP.MPA.136 AMC1 SPA.SET-IMC.105(d)(2)	

	GM1 SPA.SET-IMC.105(d)(2) Not clearly defined. Too subjective. Lack of control. Weather minima? Wind direction & strength? Nav database information of location of landing sites; what about direction of landing? Nav accuracy, RAIM outages etc.? Guidance material should be more expansive. Qinetiq 12.6 - additional margins to landing sites would reduce the number available or would it eliminate unsafe landing sites?
response	Partially accepted. Some guidance has been introduced in the draft resulting text to provide information to the operator on the criteria to be considered when assessing a landing site.

3. Proposed amendments — Regulation (EU) No 965/2012 — Part-CAT — CAT.OP.MPA.180 p. 12-13

comment	*86* comment by: *Nordflyg* Take-off alternate 30 minutes of flying time at normal cruising speed in still air conditions is not in line with CAT.OP.MPA.185 which states 60 minutes.
response	Not accepted. CAT.OP.MPA.185 is not related to the distance of the take-off alternate, but rather provides a requirement on the weather forecast at the alternate aerodromes during a certain period of time (1 hour before and 1 hour after the estimated time of arrival). It is, therefore, considered that there is no consistency issue with regard to the proposal in CAT.OP.MPA.180 for a take-off alternate no further than 30 min flying time for CAT SET-IMC operations.

comment	*126* comment by: *Nigel Johnstone* Take-off alternate CAT.OP.MPA.180 Required within 30 minutes flying time. This is academic after an engine failure.
response	Not accepted. CAT.OP.MPA.180 is not only related to the issue of engine failure. It is, indeed, considered that diversion to a take-off alternate, when it is not possible to use the departure aerodrome as a take-off alternate, could be necessary for many other technical or operational reasons.

3. Proposed amendments — Regulation (EU) No 965/2012 — Part-CAT — CAT.POL.A.300 p. 13

comment	*23* comment by: *DGAC France* The text should make it clear that SET in IMC is forbidden unless SPA.SET-IMC is applied For example, that is the way CAT.OP.MPA.140 on "Maximum distance from an adequate aerodrome for two-engined aeroplanes without an ETOPS approval"is structured : *"Unless approved by the competent authority in accordance with Annex V (Part-SPA), Subpart F , the operator shall not operate a two-engined aeroplane over a route that contains a point further from an adequate aerodrome, under standard conditions in still air, than..."* French DSAC proposes to copy paste the same structure for CAT.POL.A.300 *:* *" Unless approved by the competent authority in accordance with Annex V (Part-SPA), Subpart L (SET-IMC):* *(a) The operator shall not operate a single-engined aeroplane:* *(1) at night; or* *(2) in IMC except under special VFR.* *(b) The operator shall treat two-engined aeroplanes that do not meet the climb requirements of CAT.POL.A.340 as single-engined aeroplanes"*
response	Accepted. The resulting text has been amended accordingly.

comment	*63* comment by: *CAA-NL* Is it the correct interpretation of the suggested change of CAT.POL.A.300 that two engine aeroplanes that do not meet the clime requirements must fly under the same regime and approvals as Single Engine Turbine aeroplanes?
response	Not accepted. This provision for two-engined aeroplanes is already contained in Regulation (EU) No 965/2012 as it is applicable today, and is part of the rule text which has been adopted in 2012. No modification was intended to this current requirement. The resulting text has been slightly amended to further clarify this.

comment	*98*	comment by: *UK CAA*
	Page No: 13 **Paragraph No:** CAT.POL.A.300 General **Comment:** The NPA proposes to delete the general prohibition in CAT.POL.A.300 on single engined aeroplanes being operated at night or in IMC. UK CAA suggests that this paragraph remains valid for most single engined operations and should only be waived for the specific certain single engined aeroplanes that have been authorised for SET-IMC. **Justification:** NPA 20014-18 is only relevant to a specific category of single engine aeroplane, namely single-engined turbine aeroplanes and with a demonstrably reliable engine/airframe combination. Many other Class B types are powered by reciprocating engines. Those aeroplanes which do not meet the SET-IMC criteria (and this may include turbine types) should continue to be subject to the unchanged requirements of CAT.POL.A.300(a). **Proposed Text:** (i) Leave CAT.POL.A.320 unchanged. (ii) Amend CAT.POL.A.300 as follows:- ***CAT.POL.A.300 General*** *(a) The operator shall not operate a single-engined aeroplane:* *(1) at night; or* *(2) in IMC except under special VFR.* *(b) The operator shall treat two-engined aeroplanes that do not meet the climb requirements of CAT.POL.A.340 as single-engined aeroplanes.* ***(c) Paragraph (a) does not apply to single-engined turbine aeroplanes approved by the competent authority in accordance with Annex V (Part-SPA), Subpart L (SET-IMC).***	
response	Partially accepted. The Agency agrees with the intent of the comment and has updated this paragraph in the draft resulting text in a similar way.	

comment	*147*	comment by: *Finnish Transport Safety Agency*
	Finnish Transport Safety Agency strongly supports the intention to allow commercial air transport aeroplane operations at night or in IMC using single-engined turbine aeroplane in Europe.	
response	Noted.	

3. Proposed amendments — Regulation (EU) No 965/2012 — Part-CAT — CAT.POL.A.320 p. 13

comment

87 comment by: *Nordflyg*

RVR for take-off is not specified in NPA 2014-18. Appendix A, Risk Assessment, Scenario 2, gives an indication of RVR800 but in the regulatory text the take-off RVR is not specified. RVR800 as a general limit is appropriate and correlates with AMC9 CAT.OP.MPA.110 - Visual approach operations. Lower RVR for take-off should be possible at the discretion of the competent authority and be based on operator assessment.

response

Accepted.

The Agency acknowledges that there were no specific provisions in NPA 2014-18 related to take-off minima for CAT SET-IMC operations. An amendment to AMC1 CAT.OP.MPA.110 introducing a minimum RVR value of 800 m for CAT SET-IMC operations (with a possibility for lower RVRs under specific conditions) has been introduced into the draft resulting text.

comment

99 comment by: *UK CAA*

Page No: 13

Paragraph No: CAT.POL.A.320 En-route – single-engined aeroplanes

Comment: The NPA proposes to exclude SET-IMC from the provisions of paragraph CAT.POL.A.320 En-route – single-engined aeroplanes.

Justification: UK CAA suggests that this is the wrong paragraph to be referenced. CAT.POL.A.320 addresses the proper planning of the en-route phase of the flight, and specifically the glide path to be followed following engine failure, which is especially critical for SET-IMC and this remains just as valid for SET-IMC operations under marginal operating conditions that are referred to in the Safety Risk Assessment (Appendix A).

The relevant paragraph for any exemption for SET-IMC is: CAT.POL.A.300. (See comment against CAT.POL.A.300 General).

CAT.POL.A.320 should not be changed as a result of these proposals.

response

Accepted.

The Agency agrees with the intent of the comment and has updated this paragraph in the draft resulting text to further clarify this.

comment

125 comment by: *Nigel Johnstone*

	Weather Minima CAT.POL.A.320 AMC1 SPA.SET-IMC.105(d)(2) Operators only required to give consideration to weather minima even for sites where not met information is available? Qinetiq 12.4 - impractical to set weather minima for every landing site? In which case, set a generic high minima, say 3000'/5km, and allow specific sites to have lower minima is specifically assessed and objectively justified. With such high minima, weather could be assessed from area forecasts. Qinetiq 12.4 RIA - How can flying longer routes to make more landing sites available not improve safely.
response	Not accepted. Depending on the landing site selected, such generic high minima are considered overprescriptive. It is considered that it is up to the operator to assess the prevailing weather information on the selected landing site to determine whether it allows a safe forced landing to be conducted. This is considered to be part of the general risk assessment of its SET-IMC operations integrated in its management system.

3. Proposed amendments — Regulation (EU) No 965/2012 — Part-SPA — SPA.SET-IMC.100 p. 13

comment	*10* comment by: *Pilatus* Whilst the paragraph (b) details "specific maintenance instructions and procedures.." in accordance with Part M, it might be worth referencing the experience gained with ETOPS procedures that have evolved over years of practice with maintenance procedures that have ensured the safety of the world's twin-jet fleet. It is likely that some of that practice could read across to SET-CAT.
response	Partially accepted. The intent of the comment is shared, but it is not found appropriate to mention the ETOPS experience in the draft text as it relates to different types of operations. Nevertheless, it has been added to the Explanatory Note to the Opinion.

3. Proposed amendments — Regulation (EU) No 965/2012 — Part-SPA — SPA.SET-IMC.105 p. 13-14

comment	*47* comment by: *ECOGAS/SVFB/SAMA* It would be beneficial to refer to ETOPS gained experience (in the airline sector) and take the lesssons learned and practices developed there into consideration
response	Partially accepted. The intent of the comment is shared, but it is not found appropriate to mention the ETOPS experience in the draft text as it relates to different types of operations. Nevertheless, it has been added to the Explanatory Note to the Opinion.

comment	*94* comment by: *Nordflyg* (c)We note that EASA via the NPA2014-18 have come to the conclusion that a 2 person crew generate no positive safety impact compared to single pilot operation. (NPA2014-18, p.52 - Qinetiq recommendations 12.1/9.4.1). One engine is considered by EASA as a risk but one pilot is not. We suggest a requirement of 2 pilots to operate SET-IMC as mitigation instead of the requirement to identify landing sites at all points along a route.
response	Partially accepted. As indicated in the Explanatory Note to NPA 2014-18, the fatal accidents database for SET aircraft with engine involvement was reviewed and it was concluded that in almost all cases a second pilot would not have helped. One of the main cause identified was related to the lack of flight preparation, leaving the flight crew insufficiently prepared to manage an emergency situation following a power loss. However, the Agency acknowledges that while a requirement for a second pilot is not in general appropriate (aircraft single-pilot certified, consistency with the light twins' possibility to be operated in CAT with one pilot in IFR), in the case of flight crew with limited experience of such operations, a second pilot could provide an efficient mitigation to manage the additional workload and pressure. The resulting text of SPA.SET-IMC. 105 has been amended to include experience criteria for flight crew for single-pilot operations.

comment	*127* comment by: *Nigel Johnstone* Route and Instrument Procedures AMC1 SPA.SET-IMC.105(d)(2) If an instrument departure is required as well as a take-off alternate, how can the pilot find a landing site? If using instrument arrivals with RNAV/GPS approaches, which can be operated to quite low minima (~400' aal), how will the pilot navigate to a landing surface?

response	Partially accepted. AMC1 SPA.SET-IMC.105(d)(2) has been amended to clearly state that appropriate SIDs have to be selected to the extent possible. In any case, it should be noted that the operator can still make use of a risk period if no landing site is available.

comment	*128* comment by: *Nigel Johnstone* Crew Training SPA.SET-IMC.105 Approval requires training & checking. How often and how achieved? Flight simulators? Taking an aircraft off-line in an economically stretched company?
response	Partially accepted. In any case, the periodicity of the training/checking is the one required in Subpart FC (FLIGHT CREW)of Annex III (Pat-ORO) to Regulation (EU) No 965/2012. The text has been modified to indicate that when a simulator is available, the training/checking should be performed in this simulator rather than in the real aircraft.

3. Proposed amendments — Regulation (EU) No 965/2012 — Part-SPA — SPA.SET-IMC.110 p. 14-15

comment	*7* comment by: *Pilatus* With regards to §(e): This paragraph require that sufficient additional oxygen be available for all occupants during the descent with best range gliding speed & configuration until sustained cabin altitudes below 13 000ft are reached. The Pilatus position is that this requirement can be complied with when the correct size supplemental oxygen system is installed. However this requirement is not in line with the more the "stringent" requirement of CAT.IDE.235 c) where it is required to have the automatic deployment of the individual oxygen dispensing units if a safe decent from a pressure altitude of 25 000ft to 13 000ft in four minutes cannot be demonstrated. Pilatus requests EASA to clarify how SPA.SET-IMC.110 should be interpreted against the requirements of CAT.IDE.235 c)? With regards to §(f): "an area navigation system using equipment qualified for approach accuracies and capable of being programmed with the positions of landing sites. Pre-programmed positions shall not be altered in flight";

	Pilatus request that clarification be provided with what is meant by "Pre-programmed positions shall not be altered in flight". It is not clear anywhere in the document if this can be achieved via procedures or if this has to be an inbuilt function into the FMS? Currently the pilot can make a "pilot defined waypoint" in flight and create an VNAV approach (only VFR) to it. This could be a "pre-programmed position which is altered (created) in flight.
response	Partially accepted. — In any case, the requirements of CAT.IDE.A.235 are applicable to CAT SET-IMC operations, including the requirement for automatic deployable oxygen-dispensing units. Therefore, in any case, pressurised aeroplanes not fitted with automatic deployable oxygen-dispensing units and with an individual CofA after 8 November 1998 cannot be operated at pressure altitude above 25 000 ft. Regarding flights below 25 000 ft., a new AMC has been added to the draft text to indicate how this should be implemented for SET-IMC aeroplanes. Basically, it is considered that, in case of an engine power loss, the flight crew has to manage the emergency descent in order to ensure that the cabin pressure altitude does not remain above 13 000 ft for more than four minutes. — The intent of the requirement related to the position of landing sites in the navigation system is to ensure that these positions are programmed in the navigation system before the flight. This is, in any case, not designed to be a requirement on the navigation system itself. For clarity, this requirement has been moved to the flight planning part.

comment	*28* comment by: *Swedish Transport Agency, Civil Aviation Department (Transportstyrelsen, Luftfartsavdelningen)* SPA.SET-IMC.110 Original text: (i) an emergency electrical supply system (battery) of sufficient capacity and endurance capable of providing power following the failure of all generated power, for additional loads necessary for: (1) … (2) the means to provide for one attempt at engine restart; Suggested text: (i) an emergency electrical supply system (battery) of sufficient capacity and endurance capable of providing power following the failure of all generated power, for additional loads

	necessary for: (1) … (2) the means to provide for two attempts at engine restart; <u>Discussion:</u> Since human factors should be regarded in the rulemaking process, the persons involved at the Swedish Transport Agency regards only one engine restart attempt as a major risk. For instance, in a stressed situation such as a flame out with one engine, the situation could easily result in a pilot committing an error in the restart process. If not sufficient battery capacity is available this could either leave the pilot with zero effective restart attempts, or actually the pilot trying a second time and thereby draining the battery of emergency power for instruments. The second scenario could also be true if the engine failure occurs at a high altitude. At very high altitude it would be tempting to try a second restart. Again this would lead to the risk of draining emergency power for instruments. Another scenario would be a successful relight attempt, but a second flame out within a couple of minutes. The emergency battery would not have been charged sufficient for a second restart. <u>Conclusion:</u> Given the reasons above, the Swedish Transport Agency suggests that the regulations should include sufficient emergency battery capacity and endurance for at least two engine restart attempts.
response	Not accepted. The PWC database of accidents with engine involvement has been reviewed as mentioned in NPA 2014-18, and it has been noted that, in case of an IFSD, the engine is always so badly damaged that a second attempt would not help. It is worth noting as well that the consistency with the procedures defined by the TCH in the AFM in case of an engine failure has to ensured, and, therefore, it is not found appropriate to require a second relight attempt capability. As a matter of fact, the PC12 procedures require the pilot to make a single attempt and then fly the aircraft.

comment	_29_ comment by: _Swedish Transport Agency, Civil Aviation Department (Transportstyrelsen, Luftfartsavdelningen)_ SPA.SET-IMC.110 <u>Original text:</u> SPA.SET-IMC.110 Additional equipment requirements for SET-IMC operation Aeroplanes used for SET-IMC operations shall be equipped with:

	(a)… <u>Suggested text:</u> SPA.SET-IMC.110 Additional equipment requirements for SET-IMC operation Aeroplanes used for SET-IMC operations shall be equipped with: (a) … (m) an autopilot with at least altitude hold and heading mode *(ref. CAT.IDE.A.135 Additional equipment for single-pilot operation under IFR)* <u>Discussion:</u> NPA 2014-18 does not require an autopilot to be available. Single pilot IFR is handled in CAT.IDE.A.135, but this could be a suitable risk mitigator. An autopilot on this category of aircraft is considered to be part of the normal equipment, but should be included in the requirements. <u>Conclusion:</u> A new text is suggested including a requirement for an autopilot.
response	Not accepted. In any case, CAT.IDE.A.135 is applicable to SET-IMC operations and, therefore, an autopilot is already required for such operations in case of single-pilot operations.

comment	*38* comment by: *IAOPA Europe* Couldn´t a radio-altimeter as under g) be replaced with a Synthetic Vision System?
response	Not accepted. A radio altimeter is considered to be the most appropriate equipment for CAT SET-IMC to manage the emergency descent and the flare on the landing site.

comment	*64* comment by: *CAA-NL* (h) Does the 200 ft. means an altitude of 200 ft. or a distance over the ground of 200 ft.?
response	Noted. SPA.SET-IMC.110(h) clearly mentions ‘from 200 ft on the power off glide path’; therefore, it

means at a distance of 200 ft which does not represent an altitude.

comment

100 comment by: *UK CAA*

Page No: 14

Paragraph No: SPA.SET-IMC.110 (h)

Comment: A requirement of 400ft would be better.

Justification: The requirement for a landing light to illuminate the touchdown point from 200 ft. gives little time for the pilot to adjust the flight path.

Proposed Text: Replace '200 ft.' with '400 ft.'

response

Not accepted.

Currently, certification standards do not prescribe any specific quantified illumination capability. Nevertheless, a 200-ft requirement has been proposed as it has been proven during flight testing performed by PILATUS that this was allowing a safe forced landing to be performed at night and was also allowing the pilot to adjust the flight path. The 200 ft requirement has, therefore, been kept in the draft resulting text.

comment

131 comment by: *Glass Eels Ltd*

Comment:

Summary

Given a SBAS enabled GPS with Terrain Awarness Warning System (TAWS), a radio altimeter gives the pilot no additional command data.

Discussion

The additional safety afforded by carriage of a radio altimeter is considered to be limited. The radio altimeter does not aid safe terrain avoidance during the glide to a landing site since it provides only the historical height above ground and no cues as to how to manoeuvre to avoid terrain and obstacles. The option of applying power to avoid high ground indicated by the radio altimeter is not available. The required area navigation system using equipment qualified for approach accuracies [para (f)] provides horizontal and vertical position and terrain avoidance data to the pilot with a conservative accuracy of 4m or better for 95% of the time [Reference FAA GPS WAAS PS Oct 2008], in a format which provides readily interpretable situational awareness, to which he can respond with course changes. Given the landing light with an illumination capability of 200 ft., dual redundant pressure altimeters that may reasonably expected to be correctly set when flying under IFR and validated elevation data at the surveyed landing site, the contribution of the radio altimeter is negligible.

	From a regulatory view point it would be inconsistent to allow an SBAS approach in compliance with Annex II of AMC 20-28, *Airworthiness Approval and Operational Criteria related to Area Navigation for Global Navigation Satellite System approach operation to Localiser Performance with Vertical guidance minima using Satellite Based Augmentation System*, which has no requirement for a radio altimeter for a powered approach and then to deny essentially the same approach to the same airfield (now a planned landing site) in the event of an engine failure, because of the absence of a radio altimeter. **Proposed Text: (Additions in Yellow)** Aeroplanes used for SET-IMC operations shall be equipped with: (a)two separate electrical generating systems, ... (b) Two attitude indicators, powered from independent sources; (c) for passenger operations, a shoulder harness ....for each passenger seat; (d) an airborne weather detecting equipment; (e) in a pressurised aeroplane, sufficient additional oxygen .... (f) an area navigation system using equipment qualified for approach accuracies and capable ofbeing programmed with the positions of landing sites. Pre-programmed positions shall notbe altered in flight; (g) Where routing within an area where a satellite-based augmentation system is unavailable, a radio altimeter; (h) a landing light, ... (i) an emergency..
response	Not accepted. A radio altimeter is considered to be the most appropriate equipment for CAT SET-IMC operations to manage the emergency descent and the flare on landing sites, especially those which are not aerodromes but simple fields, for example.

comment	*139* comment by: *Daniel HUNN* The one vital piece of equipment missing from this list is some form of flight data recording (CVR, FDR and/or video recording). As this type of operation proliferates, as it surely will if the economic benefits are to be believed, it is essential that incidents and accidents can be thoroughly and correctly investigated. This type of operation is complex, challenging and immature; it is vital that lessons can be learned quickly after incidents and accidents occur.
response	Not accepted. The issue 'flight recorders for light aircraft' does not fall under the scope of this rulemaking

task (RMT). The agency is currently processing another rulemaking task (RMT.0271) related to recorders for lightweight aeroplanes. The need for recorders for such aeroplanes is being assessed within the frame of this RMT.

comment | *145* | comment by: *General Aviation Manufacturers Association / Hennig*

EASA proposes in SPA.SET-IMC.110(e) an equipment requirement that "*in a pressurised aeroplane, sufficient additional oxygen for all occupants to allow descent following engine failure from the maximum certificated cruising altitude, to be made at the best range gliding speed and in the best gliding configuration, assuming maximum cabin leak rate, until sustained cabin altitudes below 13 000 ft. are reached.*"

GAMA notes that a parallel requirement for oxygen exists in CAT.IDE.A.235 which is similar but not the same requirement for oxygen for crew and passengers.

CAT.IDE.A.235 Supplemental oxygen - pressurised aeroplanes

(a) [...]

(b) Pressurised aeroplanes operated at pressure altitudes above 25 000 ft. shall be equipped with [...] (3) an oxygen dispensing unit connected to oxygen supply terminals immediately available to each cabin crew member, additional crew member and occupants of passenger seats, wherever seated;

(c) In the case of pressurised aeroplanes first issued with an individual CofA after 8 November 1998 and operated at pressure altitudes above 25 000 ft., or operated at pressure altitudes at, or below 25 000 feet under conditions that would not allow them to descend to 13 000 ft. within four minutes, the individual oxygen dispensing units referred to in (b)(3) shall be automatically deployable.

GAMA notes that the following with respect to the typical SET aeroplanes with respect to service ceiling:

- Cessna 208: 25 000 ft.
- Cirrus SF-50: 28 000 ft. (in development)
- Pilatus PC 12: 30 000 ft.
- Piper PA-46-500TP: 30 000 ft.
- SOCATA TBM 700 / 850 / 900: 31 000 ft.
- Quest Kodiak 100: 25 000 ft.

While CAT.IDE.A.235 is not subject to this NPA, it should be recognized that some of the aeroplanes for which a CofA was issued after 1998 do not have automatically deployable oxygen dispensing units, but instead some type of mask or quick donning mask. (Later versions of these airplanes in some cases do have the automatically deployable mask.)

It should be further noted that the time of useful consciousness (TUC) at 25 000 to 30 000 ft.

	is between 1 and 6 minutes which provides sufficient time to properly don an oxygen mask. GAMA recommends that an accommodation be made for those aeroplanes that have a CofA issued after 8 November 1998 and do not have an automatically deployable mask, but other type of easily accessible oxygen mask. These aeroplanes should be provided a path to use the existing aircraft oxygen equipment through an alternative means of compliance, such as leveraging specific information in a passenger briefing, and still operate above 25 000 ft. and obtain the safety benefits of the longer gliding distance achieved at the higher altitude. (GAMA also notes that aeroplanes with a service ceiling above 25 000 ft. would not be required to equip with an automatically deployable oxygen dispensing unit if limited to operations at or below 25 000 ft.)
response	Partially accepted. In any case, the requirements of CAT.IDE.A.235 are applicable to CAT SET-IMC operations, including the requirement for automatic deployable oxygen-dispensing units. Therefore , in any case, pressurised aeroplanes not fitted with automatic deployable oxygen-dispensing units and with an individual CofA after 8 November 1998 cannot be operated at pressure altitude above 25 000 ft. Regarding flights below 25 000 ft, a new AMC has been added to the draft text to indicate how this should be implemented for SET-IMC aeroplanes. Basically, it is considered that, in case of an engine power loss, the flight crew has to manage the emergency descent in order to ensure that the cabin pressure altitude does not remain above 13 000 ft for more than four minutes.

comment	*150* comment by: *General Aviation Manufacturers Association / Hennig* GAMA notes that in SPA.SET-IMC.110 Additional equipment requirements for SET-IMC operations the agency is aligned with ICAO Annex 6 Part I. GAMA does note that since the promulgation of Amendment 29 there has been a technology evolution that impacts the typical SET aeroplanes. As an example, all current production and most of the SET aeroplanes issued a CofA since around 2005 are equipped with electronic flight displays that have advanced capabilities. The proposed regulation in (g) requires a radio altimeter system on the SET aeroplane. GAMA recommends that the agency provide for an alternative means of compliance to (g) in recognition of the capabilities that exist in some of the modern cockpits including electronic flight displays with synthetic vision technology or other capabilities that provides the pilot with a quick way to determine field elevation of the intended landing site. This technology provides the pilot with superior information and situational awareness when compared to information provided by a radar altimeter. By providing a mechanism for the alternative means of achieving the same safety objective, the agency would provide a performance based approach to safety that was not considered at the time of the promulgation of

	Amendment 29 to Annex 6 Part I.
response	Not accepted. A radio altimeter is considered to be the most appropriate equipment for CAT SET-IMC operations to manage the emergency descent and the flare on landing sites, especially those which are not aerodromes but simple fields, for example.

comment	*156* comment by: *BENAIR* § (i) sub-paragraph (7) should be either suppressed or re-written since today : • no SET aircraft is equipped with a windshield-wiper • no SET aircraft will have available hot air for window defogging in case of engine in-flight shutdown. If this sub-paragraph cannot be suppressed, we suggest to replace "if appropriate" by "if installed".
response	Accepted. The draft resulting text has been modified accordingly.

3. Proposed amendments — ED Decision 2012/016/R — Part-ARO — AMC3 ARO.OPS.200 p. 15

comment	*11* comment by: *Pilatus* Whilst validation of the operator will clearly be necessary before approval is given, it is the view of Pilatus that the most appropriate resource for this shall be a Full Flight Simulator. (See also comment at §3.7)
response	Not accepted. The intent is for the Competent Authority (CA) to oversee a normal CAT SET-IMC flight as it is planned to be operated and not a simulated one in a simulator. In order to further mitigate the risks of simulating emergency procedures, some additional provisions have been added to draft AMC3 ARO.OPS.200.

comment	*88* comment by: *Nordflyg*

	VALIDATION OF OPERATIONAL CAPABILITY (a)(b) Flight demonstration/validation of operational capability should not apply for operators currently operating SE-IMC due to the presence of historical operational data including authority audits when the competent authority has had the opportunity to verify operational capability.
response	Not accepted Existing exemptions cannot in any case be addressed at IR level. However, it is considered that it is up to the CA to determine how to implement this requirement taking into account the operator's previous experience.

comment	*101* comment by: *UK CAA* **Page No:** 15 **Paragraph No:** 'Validation of Operational Capability' **Comment:** The 'adverse conditions' required for the simulated emergencies are not clearly defined. It is unclear whether they are in simulated IMC or real. **Justification:** If these conditions are not defined there would be the possibility of different NAAs conducting these flights to varying standards.
response	Accepted. The draft resulting text has been modified accordingly.

comment	*129* comment by: *Nigel Johnstone* Specific Approval AMC3 ARO.OPS.200 What's to stop a manufacturer test pilot being used for the approval before 'average' line pilots are released onto the network.
response	Not accepted. The intent is to observe a flight performed by the operator in accordance with its procedures and together with its crew, and not by test pilots. In any case, flights performed by test pilots cannot be considered as validation flights.

3. Proposed amendments — ED Decision 2012/017/R — Part-ORO — AMC3 ORO.MLR.100	p. 16-17

comment | *12* comment by: *Pilatus*

C2(c). The paragraph makes reference to “obstacles in the area”, however, Pilatus believe that obstacles should be classified into “fixed” and “mobile”.

Fixed obstacles may be expected to remain static. However, potential landing areas could easily become populated with mobile obstacles (vehicles for example) and therefore there exists a need to classify both, and to have a suitable mechanism to regularly survey the landing sites for the addition of “mobile” obstacles.

response | Partially accepted.

To address this issue, the draft resulting text has been amended to require the operator to asses on a regular basis its selected landing sites. Furthermore, additional considerations regarding landing sites have been added as supplementary guidance to operators for the assessment of landing sites.

comment | *89* comment by: *Nordflyg*

OM C

2 (a) Description of the landing site (position, surface, slope, elevation,…)

(b) preferred landing direction

(c) obstacles in the area.

If landing sites have to be independently identified, we suggest using the phrase “all information as can be reasonably practical to acquire shall be used in order to establish the specifics of landing sites”. The collection of valid terrain and obstacle data to be used as information with regards to airports is a task normally performed by national authorities due to the complexity of changing landscapes and surrounding terrain/obstacles. A landing site based on an open field owned by a private farmer might be the only solution for a route. A small operator does not have the resources to ensure the integrity and validity of terrain and obstacle data at all times for areas that are not under authority control and this regulation implies that the operator shall establish procedures that normally apply for national authorities when issuing information in AIP.

response | Accepted.

The draft resulting text has been amended accordingly.

3. Proposed amendments — ED Decision 2012/019/R — Part-SPA — AMC1 SPA.SET-IMC.105 p. 17

comment

78 comment by: *Hendell Aviation*

AMC1 SPA.SET-IMC.105 (d) (2)

FLIGHT PLANNING

(b)

In flight planning the risk period should not be a fixed value. The fixed value of 15 minutes is far too strict while the flight safety is not considerably increased.

JAA SE-IMC/AASG/10 (9 JULY 2001) shows that the Fatal Accident Rate per million flight hours is 0.18 with 0 min risk period, 0.19 with 15 min risk period and 0.21 with 30 min risk period. The NPA2014-18 sets the target Fatal Accident Rate to less than 4 per million flight hours. Thus the above figures representing the different risk periods are negligible compared to the actual target level. For example, a 30 min risk period compared to 0 min risk period would contribute less than one per cent of the entire target level [(0.21-0.18)/4 = 0.75%]. Furthermore, most of the world is operating according to ICAO Annex 6 with an unlimited risk period.

Hence, we propose that the risk period should be a combination of the aircraft type and its statistical safety history. The default risk period value should be at least 30 minutes based on previous chapter's argument. Moreover, the operator should be able extend that by a coefficient relative to the aircraft statistical safety record.

response

Partially accepted.

The Agency recognises that the risk level could be managed appropriately for flights with risk periods of more than 15 min per flight. It is as well acknowledged that this 15-min limit might lead to operational practices adding additional risks.

Therefore, the draft resulting text has been amended to provide a possibility to extend the risk period available, based on a risk assessment to be established by the operator for the specific route concerned.

3. Proposed amendments — ED Decision 2012/019/R — Part-SPA — AMC1 SPA.SET-IMC.105(a) p. 17

comment

102 comment by: *UK CAA*

Page No: 17

Paragraph No: AMC1 SPA.SET-IMC.105(a) SET-IMC operations - turbine engine reliability, sub-paragraph (c)

Comment: This paragraph proposes that 20,000 hours of engine-airframe combination operation is required to demonstrate an engine failure probability of 10 per million flight hours. This number of hours would give little statistical confidence because there should not be any propulsion failures during 20,000 hours of operation from a system with a envisaged reliability of 1 x 10^{-5}. This amount is insufficient to provide any meaningful statistical confidence.

Justification: In order to achieve a higher level of statistical confidence a greater value is appropriate, for example 300,000 hours is suggested as this would give a 90% level of confidence.

Proposed Text: Amend paragraph (c) as follows:-

"The in-service experience of the intended airframe/engine combination should be at least ***300 000*** *~~20 000~~ hours, …"*

response

Partially accepted.

The Agency recognises that 20 000 hours of operations provide a too small sample to assess the engine reliability. This criterion has, therefore, been amended and aligned with the TCCA provisions, i.e. a minimum of 100 000 hours of operations, which is considered more appropriate.

comment

122 comment by: *Piper Aircraft Inc.*

Piper Aircraft believes the requirement for airframe/engine combination to have a demonstrated 20,000 hours level of reliability to be an arbitrary and artificial barrier for a SET product with no similar barrier for CAT twin engine operations. Additionally the majority of SET aircraft are owner/operator and flown outside the scope of CAT operations and are not required to report hours of operation. In-service fleet hours are based on a calculated estimate with little actual operational fact. Piper Aircraft believes that a rational estimate of fleet hours or an analytical method of projecting level of reliability at a minimum of 20,000 hours of operation should be acceptable.

response

Not accepted.

The issue of an engine/airframe combination not having reached the required number of hours of operations is already addressed in AMC1 SPA.SET-IMC.105(a). Please refer to NPA 2014-18 for further rationales.

comment

146 comment by: *General Aviation Manufacturers Association / Hennig*

EASA identifies in AMC1 SPA.SET-IMC.105(a) what data to use for the purpose of

	demonstrating a required level of engine reliability. ***AMC1 SPA.SET-IMC.105(a) SET-IMC operations*** *TURBINE ENGINE RELIABILITY* *(a) [...]* *(b) The data considered **relevant and reliable** for the engine-airframe combination should have demonstrated, or likely to demonstrate, a rate of turbine engine in-flight shutdown, or loss of power for all causes such that a forced landing is inevitable, of less than 10 per million flight hours.* *(c) [...]* GAMA supports (b) as proposed by the agency. It is essential that the IFSD data used for this analysis in relevant and reliable which can be determined through appropriate root-cause analysis. As an example, intentional pilot mismanagement of the aircraft that results in an IFSD event should not be considered a "relevant" event for the purpose for the determination of the rate. Similarly, some of the SET aeroplanes that are used in CAT operations currently within Europe, by way of a derogation, and outside Europe may be primarily conducting non-CAT operations that is regulated as general aviation. The wording in (b) provides the needed mechanism for a manufacturer to determine whether their operational experience in non-CAT operations is "relevant" for the purpose of the in-service experience analysis identified in (c).
response	Noted.

3. Proposed amendments — ED Decision 2012/019/R — Part-SPA — AMC1 SPA.SET-IMC.105(b)	p. 17-18

comment	*2* comment by: *VOLDIRECT* *"The engine programme should include, as a minimum, engine hours flown in the period and the* *power loss rate for all causes and engine removal rate, both rates on a 12 month moving average* *basis. "* Considering the current, proven PT6 reliability rate (<5 E-6), and knowing that SET aircraft are in average operated 500 hours a year, it is very unlikely that any SET operator will ever reach a size where their operations are statistically meaningful especially when considered on a 12-month moving basis.

Taking the above in consideration , an annual report seems more relevant if :

- focused on critical events (primarily identified by unscheduled engine repairs, and/or removals)

- assessed with an historical perspective rather on a 12-month moving average

- placed in operational context with information from the complete operator's fleet to isolate possible causes specific to the operator (environment, maintenance)

To feed the information back to the OEMs / TC holders is essential , as the CAA may

- not have the internal resources to proceed the data

- not pass it on further to the OEMs / TC Holders preventing thereby the appropriate and necessary data aggregation on a global basis

A proposed wording is:

"The engine programme should include, as a minimum, engine hours flown in the period and the power loss rate for all causes and engine removal rate, both rates on an annual basis, and reports focusing on critical events and with the operational context. These reports should be communicated to the TC holder and to the Authority".

response

Accepted.

The draft resulting text has been modified accordingly.

comment

24 comment by: *DGAC France*

AMC1 SPA.SET-IMC.105(b) sates (page 18) :

"For engines, the programme should incorporate reporting procedures for all significant events. This information should be readily available (with the supporting data) for use by the operator, type certificate holders (TCHs) and the competent authority to help establish that the reliability level set out in AMC1 SPA.SET-IMC.105(a) is achieved"

French DSAC would find it detrimental to safety if those events/data were not gathered at a european level. If gathered, such sets of events/data would be more comprehensive of course and would allow to better reflect trends.

What is requested from EASA is to just adapt to AMC1 SPA.SET-IMC.105(b) the principle established in AMC 20-6 rev2, paragraph 6, subparagraph b. on "*Surveillance of mature ETOPS products".* This paragraph establihes the principle of in-service surveillance by the Agency indeed.

This need has already been raised for helicopters needs (e.g.AMC1 CAT.POL.H.305(b) Helicopter operations without an assured safe forced landing capability

ENGINE RELIABILITY STATISTICS).

response

Not accepted.

As SET-IMC operations fall only under operational rules, the implementation of such operations is the CA's responsibility. The Agency is not legally competent to gather such information.

comment

157 comment by: *BENAIR*

Reporting is irrelevant if it doesn't help identifying the possible causes for an operator's sub-level engine reliability.

SET operators are mostly small operators, and their reports will therefore unlikely present a statistically meaningful basis that can help tackle issues. Besides, the recommended 12-month moving average basis for the engine programme reporting requirement will very much narrow down the scope of the report. 2 incidents separated by 13 months would not be visible on the report although they would represent an extremely poor engine performance ratio compared to actual standards.

We would hence recommend, instead of burdening all operators with additional reporting duties, to instead focus on identifying criteria that are specific to the operator/operations (e.g. poor engine reliability due to area of operations, maintenance procedures, etc) by imposing to the operator a duty to report to the OEM and the responsible CAA any engine incident and/or unscheduled engine repairs.

response

Not accepted.

The general intent of this requirement is not to gather statistics related to a specific operator but rather for competent authorities to compile all these information from all operators approved to conduct CAT SET-IMC flights. Therefore, it is agreed that a 12 months' basis might not be relevant at a one-operator level, but, by having all the approved operators, the sample would become larger. Moreover, considering the limited amount of information required to be reported, the Agency does not consider this as a heavy burden for operators.

3. Proposed amendments — ED Decision 2012/019/R — Part-SPA — AMC1 SPA.SET-IMC.105(c) p. 18-20

comment

21 comment by: *Pilatus*

The basic rule suggest that a full flight simulator (FFS) "may" be used thereby implying that an alternative method would be available. However, when considering the content of sub-para c it is hard to see how the requirement could be met using anything other than a FFS (level D).

It is Pilatus's opinion that training items for conversion checking and recurrent training for

	CAT SET-IMC ops imply the demand and use of a FFS. This applies especially for training of (2) Abnormal Procedures and (3) Emergency Procedures. Furthermore that proper training and checking of the stipulated items (e.g. engine-out descent in simulated IMC, depressurisation, engine re-start procedure or practice forced landing to touchdown in simulated IMC with Zero thrust set and operating on simulated emergency electrical power) will definitely have to be conducted in a simulator or at least a suitable FTD device.
response	Partially accepted. The Agency agrees that it is more appropriate to perform training on emergency procedures in a simulator. At the same time, it has to be acknowledged that a limited number of simulators for the possibly eligible aeroplanes are available. The draft resulting text has, therefore, been modified to indicate that when a simulator is available, the training/checking should be performed in this simulator rather than in the real aircraft.

comment	*65* comment by: *CAA-NL* **AMC1 SPA.SET-IMC.105(c)** (f) and (h): As the second sentence in both requirements just repeats for recurrent training and checking after the first training or checking following conversion the same requirements for this first time the second sentence can be removed when the first sentence is stated in the plural form as below. This will simplify the text. (f) Use of Simulator (recurrent training) Following conversion training and checking, the next recurrent training sessio**ns** may be conducted in either the aeroplane, or a full flight simulator. ~~**Thereafter, recurrent training may be carried out either on the aeroplane or in a full flight simulator.**~~ (h) Use of Simulator (recurrent checking). Following conversion training and checking, the next operator proficiency chec**ks** (OPC) including single-engine night and/or IMC items may be conducted in either the aeroplane, or a full flight simulator. ~~**Thereafter, single-engine night and/or IMC OPCs may be carried out either on the aeroplane or in a full flight simulator.**~~
response	Accepted. The draft resulting text has been modified accordingly.

comment	*103* comment by: *UK CAA* **Page No:** 19

Paragraph No: AMC1 SPA.SET-IMC.105(c) SET-IMC operations (3)(b) Use of simulator (conversion training); sub-paragraph 1

Comment: Some of the abnormal procedures and off airport landings at night and in IMC could only be safely and adequately trained for, and allowed to continue to a logical conclusion, in a Full Flight Simulator.

Justification To safely experience and practice Emergency and Abnormal procedures and failures for initial conversion training, which would be impossible in the aircraft or would present unacceptable risks.

Proposed Text: Replace the text of (3)(b) Use of simulator (conversion training), sub-paragraph (1) with:

"(1) A full flight simulator (FFS) must be used to carry out training in the items required in (a)(2) Abnormal Procedures and (a)(3) Emergency Procedures for single-engine night and/or IMC conversion training;"

response

Partially accepted.

The Agency agrees that it is more appropriate to perform training on emergency procedures in a simulator. At the same time, it has to be acknowledged that a limited number of simulators for the possibly eligible aeroplanes are available. The draft resulting text has, therefore, been modified to indicate that when a simulator is available, the training/checking should be performed in this simulator rather than in the real aircraft.

comment

104 comment by: *UK CAA*

Page No: 19

Paragraph No: AMC1 SPA.SET-IMC.105(c) SET-IMC operations (3)(b) Use of simulator (conversion training);sub-paragraphs (1) FFS and (2) FTD

Comment: It should be noted that there will be a limited number of EASA Certificated devices available.

response

Noted.

comment

137 comment by: *Daniel HUNN*

Successful forced landing are an art form which require regular practice. Simply using the normal recurrent cycle of training/checking is unlikely to maintain the required level of competence. This is especially important as this type of operation is likely to attract pilots of lower experience and/or ability.

The expense of full flight simulators or, in economically stretched operators, an aircraft that

	can be taken off line for training will certainly mean that operators will not provide any more than the minimum mandatory training. inevitably, to reduce cost and disruption, this training is likely to take place at the operator's base which is well served by navigation aids and familiar to the pilots; this hardly replicates the likely en-route scenarios that pilots may encounter in the event of an en-route total power loss.
response	Partially accepted. The Agency agrees that it is more appropriate to perform training on emergency procedures in a simulator. At the same time, it has to be acknowledged that a limited number of simulators for the possibly eligible aeroplanes are available. The draft resulting text has, therefore, been modified to indicate that when a simulator is available, the training/checking should be performed in this simulator rather than in the real aircraft.

3. Proposed amendments — ED Decision 2012/019/R — Part-SPA — AMC1 SPA.SET-IMC.105(d)(2) p. 20-21

comment	*13* comment by: *Pilatus* Risk period of 15 minutes: Pilatus believe that the concept of a 15 minute period based simply upon risk is a worthwhile concept to link potential areas that allow safe gliding, realizing that it is not always possible to always make such a provision. The 15 minute concept will therefore allow the linking and make for a flexible rule embracing risk with a realistic opportunity to fly existing procedures such as SID and STAR.
response	Noted.

comment	*40* comment by: *IAOPA Europe* To (b)(4): Whereas we find it acceptable to carry "appropriate survival equipment" over water, we don´t know what the required survival equipment is over mountaineous areas.
response	Accepted. It is, indeed, considered that this is already appropriately covered by CAT.IDE.A.305 and that, therefore, no additional requirement is needed.

comment	*56* comment by: *ST BARTH COMMUTER*

	The 15 minutes risk period, as it is written, is inadequate: 1) 15 minutes is too low 2) Limiting to a xxx minutes risk period « per flight » is inconsistent with the idea of probability/reliability. Moreover, in certain cases, operator will have to make a landing in between the departure and final destination airport, thus making an additional landing and takeoff, which are the times where the airplane if the most vulnerable to an IFSD.
response	Partially accepted. The Agency recognises that the risk level could be managed appropriately for flights with risk periods of more than 15 min per flight. It is as well acknowledged that this 15-min limit might lead to operational practices adding additional risks. Therefore, the draft resulting text has been amended to provide a possibility to extend the risk period available, based on a risk assessment to be established by the operator for the specific route concerned.

comment	*61* ❖ comment by: *General Aviation Manufacturers Association / Hennig* EASA proposes in AMC1 SPA.SET-IMC.105(d)(2) SET IMC operations FLIGHT PLANNING that an allowance for "one or more risk periods of no more than a total of 15 minutes per flight may be determined whenever a landing site is not within gliding range and for the following operations". GAMA supports the allowance of a risk period to provide for a straight forward way to conduct flight planning and fully leverage existing navigational capabilities including procedures, such as SID and STAR, to improve traffic flow and manage safety. To ensure consistent use of the 15 minute risk period within Member States, GAMA also recommends that EASA explore promoting the 15 minute allowance from AMC into the regulation. As an example, could the 15 minute allowance be identified in CAT.OP.MPA.136?
response	Not accepted. The intent of having this 15-min limit for the risk period at AMC level was to provide more flexibility to operators since a deviation from this requirement would have to follow the AltMOC process while a deviation from an Implementing Rule (IR) would have to follow the Article 14 process which is much more complex.

comment	*71* comment by: *Daniel HUNN* The lack of a definition of 'surface' is a serious concern. Given that many of these will be 'uncontrolled' areas, their characteristics and freedom from obstacles can change,

	completely unnoticed at any time. Furthermore, the lack of definition of required weather minima in terms of cloud base, visibility and wind direction & speed leaves scope for another layer of subjective assessment. It is accepted that this type of operation is likely to be used in situations which would not be commercially viable any other in way. Therefore, by definition, these will be commercially marginal operations. As such, there will be much pressure to operate at all costs; this could easily lead to situations where the operator selects 'surfaces' which are not appropriate. Furthermore, many of these 'off-airfield' sites will require a particular direction of landing which may be precluded by the wind direction and strength on the day or require precise manouevring which may not be possible in reduced visibilty or with low cloud bases. The absence of any clear definitions is a serious concern.
response	Partially accepted. To address this specific issue, some guidance has been introduced into the draft resulting text to provide information to the operator on the criteria to be considered when assessing a landing site.

comment	*90* comment by: *Nordflyg* (a) Should not apply when operating over land. (b) Calculation of a risk period is based on max 15 minutes/flight. If a landing is made on an airport, another risk period is awarded. This implies that in order to extend a risk period it is possible to make an intermediate landing and thereby be granted another risk period. It is widely known that the take-off and landing is the most unsafe part of a flight. A planned flight from A-B with a risk period of total 30 minutes is considered less safe than if the flight is divided in 2 segments, each with 15 minutes of risk period. If landing sites have to be appointed and risk periods calculated we suggest EASA to consider a longer risk period. (c) (2) The identification of landing sites should apply for a larger region or area where the general terrain characteristics can reasonably be expected to ensure a safe forced landing at a non-disclosed landing site within the area. Suggest new text; “The identification of areas and regions where the terrain can be expected to reasonably assure the potential for a non-disclosed landing site where a safe forced landing can be made”.
response	Partially accepted. The Agency recognises that the risk level could be managed appropriately for flights with risk periods of more than 15 min per flight. It is as well acknowledged that this 15-min limit might lead to operational practices adding additional risks. Therefore, the draft resulting text has been amended to provide a possibility to extend the risk period available, based on a risk assessment to be established by the operator for the specific route concerned. Regarding the selection of areas rather than a specific landing site, it is believed that this

could be acceptable provided that at any point of this area, a safe forced landing could be performed. In any case, the current wording does not prevent this possibility, which, nevertheless, is considered quite unlikely.

comment | *105* | comment by: *UK CAA*

Page Nos: 20, 25 and 83

Paragraph Nos:

AMC1 SPA.SET-IMC.105(d)(2), and

4.1.2.2, CAT SET-IMC operations – fatal accident rate, and

Appendix A Safety Risk Assessment

Comment: These sections of the NPA include/address the use of risk periods within the assessments; the approach used does not appear consistent with some previous applications of the technique and may not reflect what was considered within the certification safety assessment arguments.

Justification: When JAR-OPS 3.517(a) "Helicopter operations without an assured safe forced landing capability" (i.e. risk periods) was being developed, the acceptable target rate for helicopters during the period at risk was 5 x 10^{-8} per event (not flight hour) but that is broadly comparable)). For an engine failure rate of $1x10^{-5}$ (per flt hr) this gave about a 10 second exposure time for a twin engine helicopter and 20 seconds for a single. Furthermore to manage the risk from such activity, rather than rely solely on a probabilistic argument, only specific helicopter operations are permitted to use this procedure ('public interest sites' and for offshore helidecks where there is, genuinely, no other realistic option.)

It is also considered that use of risk periods in this way would require changes to the applicable rules of the air Low Flying legislation, which currently requires all aircraft to be able to make an emergency landing without causing danger to persons or property on the surface in the event of an engine failure.

The methodology of calculating/using the technique of risk periods on the target level of safety should be reviewed against where it has possibly already been used within the type certification assessment.

response | Not accepted.

— It should be noted that this 1 x 10^{-8} safety target (transposed into GM1 CAT.POL.H.420) was only considering the take-off and landing phases. It is further stated that for the en-route phase, the safety rate would be rather in the order of magnitude of $1x10^{-5}$, which is higher that the target fatal accident rate for SET-IMC operations.

— Regarding the rules of the air, SERA.3101 clearly states that the mentioned requirement has to be met 'except by permission from the CA, (...)', which is clearly the case for CAT SET-IMC operations as an approval is proposed to be granted to the operator.

— In any case, operational safety targets cannot be compared to the certification safety target, as the latter encompasses many other parameters, and, as a consequence, they are always higher.

comment

107 comment by: *UK CAA*

Page No: 21

Paragraph No: AMC1 SPA.SET-IMC.105(d)(2) SET-IMC operations - Flight Planning, sub-paragraph (c)(3)

Comment: As icing conditions has the potential to exist even at the most modest altitudes in the European climate, and also that airframes cannot currently be protected in icing conditions following engine failure, the effect on the decent profile of the 'iced' aeroplane in terms of glide speeds and glide path angle should be required.

Justification: None of the existing aircraft types under consideration has an airframe de-icing or anti-icing capability that is independent of the engine. The requirements should be clearer about requiring realistic account for the effect on glide performance of accumulating airframe ice whilst descending through cloud in freezing conditions.

Proposed Text: Amend sub-paragraph (c)(3) as follows:-

"en-route specific weather conditions that could affect the capability of the aeroplane to reach the selected forced landing area following a loss of power (i.e ***including the gliding descent though cloud in freezing conditions****, severe icing conditions, headwinds, etc.);"*

response

Accepted.

The draft resulting text has been modified accordingly.

comment

132 comment by: *Glass Eels Ltd*

Attachment #1

Summary:

The 15 minute risk period is problematic and unncessary to meet the safety objective. It threatens the whole concept of SET-IMC operations. The very basis of the economic benefit is that aircaft such as the C208 serve communities that have poor transport links because they are isolated by significant stretches of water or inhospitable terrain.

The Risk Period is unnecessary because, when presented in the form of a fault tree analysis, the Scenario data in Appendix A, Safety Risk Assessment, shows that with mitigations, the safety objective can be met with a Fatal Accident rate after an engine failure of 2.9 per million flight hours. This is without recourse to the use of a 15 minute risk period or appealing to the current engine shut down rate of 5 per million hours for all causes, which is less than the 10 per million used throughout this NPA.

Comment:

The specification of a risk period per flight has the merit of managing the risk exposure period of a passenger on an event basis rather than per flight hour. However some examples of why this is problematic follow:
1. One of the areas of economic benefit of SET-IMC operations is that of serving island communities. An example would be an operator who establishes a service from Lands End (EGHC) to the Scilly Islands (EGHE) (Green Route in the attachment). The distance is just 27 Nm, all over water but within the 15 minute risk period per flight for a C208. The per flight hour risk exposure approaches 100%. From the perspective of passenger risk exposure per trip, this has no impact. But problems arise with this passenger per trip risk exposure concept.
a. Many passengers on this service will be day trippers and, unless forced to stay for a predetermined period to dilute the risk exposure, the passenger will return the same day having had a total risk exposure of 30 minutes in that day.
b. A further difficulty arises when the operator determines that it makes sense to offer tickets to island residents at marginal cost or less for flights outbound from the island in the early morning and inbound in the evening as the tidal flow of visitors means that seats would be empty. This is a great benefit to the islanders and daily commuting for key workers, business persons and school children becomes routine. Islanders could be banned from using the service but otherwise an annual risk exposure for 5 day commuting of 130 hours would be tacitly be accepted as being a reasonable risk exposure. Even at this level of risk exposure and an engine failure rate at the high end of the range of 10 per million hours, the time between engine failures for each passenger is some 700 years. Using a zero order binomial expansion for a single engine failure, it can be said with greater than 93% confidence that an islander who commutes for 50 years in this manner (26,000 trips) will not experience an engine failure. [($e^{-0.25*1e-5}$)^(2x 5x52x50) = 93.7%]

2. Despite the low level of risk associated with a 100% risk exposure, a response to this could be to revert to a risk period that is some specified fraction of a flight, say 50%. The operator can no longer offer the most economic flight and moves his base to Newquay (EGHQ) (Red Route). Now the flight is 50 Nm, with a total flight time of about 35 minutes and a risk period of 15 minutes. This would meet this new 50% rule however the risk exposure of the passenger to engine failure is unchanged, the risk exposure to all the other factors has increased, the environmental impact has increased, costs have more than doubled and the economic benefit to the community much reduced. This is clearly not the intent of the NPA.

3. There is a competitive issue. A second operator determines that there is a market for a

flight from Newquay (EGHQ) to Dublin (EIDW) (Orange Route). This enables personnel from the burgeoning aerospace park based at Newquay to take flights from Dublin to JFK and other US destinations where most their customers are. The sector is about 180 Nm and an economically direct routing has a risk period over water of about 120 Nm of 48 minutes (0.8 hours) in a C208. A businessman weekly commuting to the US has an annual risk exposure of 83 hours. This is less than 2/3rds of that which was implied as being acceptable for the 15 minutes risk period associated with the Scilly Isles' operation. There is no passenger personal risk exposure argument against this period of 48 minutes per flight once the level of safety afforded by a 15 minute period is accepted. Denying the second operator permission to provide this service is arbitrarily anti competitive.

4. The 15 minute per flight limit also fails on the touch and go principle. The Operator of the service to the Scilly Isles decides to open up a service from South Wales, Cardiff (EGFF) to Newquay with an onward flight to the Scillies and a direct return to Cardiff to capitalise on the many historic family ties between the Welsh and Cornish mining communities (Blue Route). Out bound from Cardiff the initial risk period over the Bristol Channel and the inhospitable terrain of Exmoor is 15 minutes. A landing at Newquay creates a new flight and permitted risk period for the sector to the Scillies. Another 15 minute risk period. Again it is assumed that passengers would be allowed to continue their flight at Newquay without having to be delayed for some fixed period to dilute their risk exposure. The same passengers cannot now be carried under the 15 minute rule back to Cardiff because the risk period for the flight is now 30 minutes although the actual risk exposure for the passengers and crew is identical.

5. An apparent solution to all of the above is to take a fleet wide view. In this case an operator has annual limit or allocation of risk period for his fleet. This could be set so high that the Lands End to Scillies service is unaffected (to gether with all the other potential similar highlands and islands services) however this would be to concede that the 15 minute risk period had no merit.
A lower limit would curtail the flights of an operator who had chosen to specialise in serving Highland and island communities. The obvious response to this would be partner with another operator providing services in the mainland or an area of Europe with a relatively benign terrain in order to reduce the fraction of the risk period for the fleet. This would be an unequal relationship, the mainland partner of the new business should expect a premium for the use of his risk minutes. This has in effect created an unregulated market in a new commodity, Risk minutes. The opportunity for abuse and fraud will be the same as any other unregulated market unless EASA or some other body stepped into maintain control. The way that EASA might limit the overall risk exposure of the SET-IMC fleet would be to sell risk minutes to operators and limit the total allocation of the same as function of the fleet incident rate. This is both an adminstartive burden and unnecessary to meet the safety objective.
Thus this fleet wide view turns out to be less than satisfactory. A map of the routes described above is attached

6. Conclusions

The 15 minute risk period is problematic and threatens the whole concept of SET-IMC operations.

The 15 minute risk period provides no useful reduction in the exposure experienced by a passenger to the risk of an engine failure.
A risk period of greater than 15 minutes creates no increase in passenger risk exposure for practical scenarios.
A fleet wide risk period approach can be circumvented, is subject to abuse and is counter to the economic development objectives of the NPA.
However, the flight planning and other provisions of the NPA for enhancing the safety of SET-IMC Operations are much to be commended, necessary and are sufficient to meet the fatal accident rate objective.

A risk period of 15 minutes would be supported in respect to flight over congested areas for consistency with current "GLIDE CLEAR" rules.

Proposed Text: (Additions in Yellow)

FLIGHT PLANNING
(a) The operator should establish flight planning procedures to ensure that the routings and cruise altitude are selected so as to have a landing site within gliding range.
(b) Notwithstanding (a), one or more risk periods of no more than a total of 15 minutes per flight may be determined whenever a landing site is not within gliding range and for the following operations (longer risk periods are subject to approval but will not be reasonably denied):
(1) over water;
(2) over terrain which prevents a safe forced landing to be accomplished because the surface is inadequate;
(3) over congested areas; or
(4) over areas where occupants cannot be adequately protected from the elements, or where search and rescue response/capability is not provided consistent with anticipated exposure;

response Partially accepted.

The Agency recognises that the risk level could be managed appropriately for flights with risk periods of more than 15 min per flight. It is as well acknowledged that this 15-min limit might lead to operational practices adding additional risks.

Therefore, the draft resulting text has been amended to provide a possibility to extend the risk period available, based on a risk assessment to be established by the operator for the specific route concerned.

comment | 154 | comment by: _BENAIR_

The paragraph (b) is not very clear. What does it mean that a risk period can be "determined" ?

It is meaningless that you can have only 15 minutes even if you fly non-stop for 3 hours, but could have many times 15 minutes for the same flight if you land several times enroute. Landing and T/O is more risky than overflying.

Besides, the risk period should better be indicated :

- with a maximum duration set <u>per period of exposure</u> (between 2 landing sites) and not per flight;
- with a maximum duration based on the actual turbine engine reliability rate and not on a theoretical value.

Proposed change :

"(b) Notwithstanding (a), one or more risk periods of no more than 15 minutes for each period of exposure may be used whenever a landing site is not within gliding range ..."

A provision should be included in the NPA to indicate to both the competent authorities and the operators how to calculate the maximum allowed risk period. Proposed maximum risk period calculation method :

"The maximum value of 15 minutes for a risk period as described in AMC1 SPA.SET-IMC.105(d)(2) sub-paragraph (b) is based on a rate of turbine engine in-flight shutdown, or loss of power for all causes such that a forced landing is inevitable, of less than 10 per million flight hours. When the turbine engine in-flight shutdown rate is lower than 1E-6 by a factor of "a", the risk period indicated in (b) can be extended by multiplying the 15 minutes value by the factor "a"."

response

Partially accepted.

The wording of AMC1 SPA.SET-IMC.105(d)(2) has been amended along these lines in the draft resulting text.

The Agency recognises that the risk level could be managed appropriately for flights with risk periods of more than 15 min per flight. It is as well acknowledged that this 15-min limit might lead to operational practices adding additional risks.

Therefore, the draft resulting text has been amended to provide a possibility to extend the risk period available, based on a risk assessment to be established by the operator for the specific route concerned.

3. Proposed amendments — ED Decision 2012/019/R — Part-SPA — AMC2 SPA.SET-IMC.105(d)(2) p. 21

comment | *16* | comment by: *Pilatus*

§(b) The term should not be programming the FMS, it should be more generic such as: "the aircrafts onboard navigation system shall allow the pilot to continuously overview the possible landing sites using pre-programmed airfields, airfield indications on the navigation display", Synthetic vision, EGPWS or EVS.

response

Not accepted.

The intent is to ensure that the identified landing sites are preprogrammed so that all relevant information is immediately available to the pilot in case of an engine failure, without having to assess the information provided by the equipment to determine the place where the emergency landing should be performed.

comment | *41* | comment by: *IAOPA Europe*

The decision by what criteria acceptable landing sites are to be defined is completely left up to the operator.

There are Pros and Cons. On the one hand IAOPA supports the concept of minimum rules and more responsibility for the operators, that´s finally what the GA roadmap is about. And the FAA doesn´t require to identify landing sites at all for the same operations. On the other hand as long as landing sites are required IAOPA would consider it as helpful to give the operators some guidance about thei required quality of landing sites, sooner or later this question will be asked. Some concisely defined minima like “the landing-roll plus X% in length and X-times the wing-span in width” could be a simple and helpful guidance and we offer to contribute to a further discussion on the issue.

response

Accepted.

To address this specific issue, some guidance has been introduced into the draft resulting text to provide information to the operator on the criteria to be considered when assessing a

	landing site.

comment	*60* comment by: *General Aviation Manufacturers Association / Hennig* EASA proposes in AMC2 SPA.SET-IMC.105(d)(2)(b) SET-IMC Operations that "*Landing sites suitable for a diversion or forced landing should be programmed into the area navigation system so that track and distance are immediately and continuously available.*" The agency may have unnecessarily constrained this guidance material and the same safety objective can be achieved through more general guidance more effectively. Additionally, by using the term "area navigation system", the agency can introduce confusion because of the similarity to RNAV. GAMA recommends that the agency reword the AMC and instead require that the aircraft's "navigation system" have the performance driven ability to meet the safety objective (which is reaching the landing site). As an example, the common avionics feature that would be used today to meet this safety objective is the "nearest airport" function which automatically monitors the airports that can be used as suitable diversion airports or landing sites. These airports are already part of the avionics system and wouldn't need to be "programmed" as proposed. These systems, however, do also provide for the creation of user waypoints at specific locations and the nearest function will also show user waypoints in addition to the nearest airports, VORs, NDBs, and intersections. This existing function should be considered immediately and continuously available to the pilot.
response	Partially accepted. The term area navigation system has been accordingly modified in this paragraph. A navigation system, certified in accordance with standards listed in AMC2 SPA.SET-IMC.105(d)(2), is considered to be the most appropriate means to allow the pilot to reach the selected landing site following an engine power loss. In any case, another means of compliance could be defined in accordance with the AltMOC procedure.

comment	*72* comment by: *Daniel HUNN* Realistically, a successful forced landing will require precise IMC navigation. Practically, this will only be possible with the use of GPS. The effect of degraded performance, specifically such things as RAIM outages, must be considered.

response	Not accepted. This issue is considered to be already adequately covered by certification standards included in the related AMC.

comment	*91* comment by: *Nordflyg* (a) The assessment of landing sites with regards to terrain characteristics and obstacles should be dependent on what type of information that can be reasonably expected to be available to the operator.
response	Accepted. The draft resulting text has been amended to mention that the operator should use 'all information that can be reasonably practical to acquire to establish the characteristics of landing sites'.

3. Proposed amendments — ED Decision 2012/019/R — Part-SPA — AMC3 SPA.SET-IMC.105(d)(2) p. 21-22

comment	*3* comment by: *VOLDIRECT* *"(b) Notwithstanding (a), one or more risk periods of no more than a total of 15 minutes per flight may be determined whenever a landing site is not within gliding range ..."* The total of 15 minutes per flight is a fixed value which does not reflect: • the duration of the flight • the actual risk figure of the flight. Imagine a flight from France to Tunisia overglying Corsica, then Sardainia. The portion of flight from France to Corsica may ask for 10 minutes of "risk time" (landing site not withing gliding range), and the portion of flight between Sardainia adn tunisia may also call for 10 minutes of "risk time". Total is 20 minutes, higher than the 15 minutes value: the flight is then forbidden. Now if the airplane lands in Corsica (just a touch and go!), we now have 2 flights with less than 15 minutes of risk period for each portion. The flight is now feasible. This illustrates the irrelevance of the 15 minutes PER FLIGHT. Our proposition is - either to enable to "reset the 15 min counter" whenever the aircraft along its route meets

	again the safety lanfing criteria; - or to let the Operator assess the safety for the given route and determine the maximum acceptable duration of th risk period. The new sentence proposed is: *""(b) Notwithstanding (a), one or more risk periods of no more than a total of 15 minutes for each period may be determined whenever a landing site is not within gliding range ..."* *Additionnally, the Operator may determine the maximum acceptable risk period duration for a given route, using a calculation method approved by the Authority.* ---------------------------- The 15 minutes value has been based on a typical flight profile in the QINETIQ document (Table 4, page 40 of 54), with an engine reliability factor of 10E-6. If the powerplant reliability data provided (see AMC1 SPA.SET-IMC.105(a)) is better (lower) than 1E-6, the 15 minutes value is no longer consistent. There should be a provision in the document to reassess the value. FOr example, a turbine provong 5E-6 should extend the risk value to 2 x 15 = 30 minutes. The following sentence should be added: *(d) The value of 15 minutes for a risk period as described in (b) is based on powerplant reliability equal to 1E-6. When the powerplant reliability is lower than 1E-6 by a fator of k, the risk period indicated in (b) will be extended by multiplyinh the 15-minutes value by the "k factor".*
response	Partially accepted. The Agency recognises that the risk level could be managed appropriately for flights with risk periods of more than 15 min per flight. It is as well acknowledged that this 15-min limit might lead to operational practices adding additional risks. Therefore, the draft resulting text has been amended to provide a possibility to extend the risk period available, based on a risk assessment to be established by the operator for the specific route concerned.

comment	*66* comment by: *CAA-NL* **AMC3 SPA.SET-IMC.105(d)(2)** We suggest to add the heading 'Departure' in (a) as it is done for 'Arrival' in (b) and 'En Route' in (c).
response	Accepted. The draft resulting text has been modified accordingly.

comment	*92*	comment by: *Nordflyg*
	SPA.SET-IMC.105(d)(2) indicate that the below regulation is for flight planning purpose only. Some of the wording suggests however that part of the contents of this paragraph also applies for in-flight operating procedures and therefore comments are based on that assumption. (a) Departure Departure routing shall be based on the normal departure traffic flow from an airport. Different variables affect the conditions for departing traffic including ATC requirements, weather avoidance etc. and it is impossible for operators to ensure that the airplane always will find itself in a position to reach a landing site during the departure segment. (b) Arrival Impractical and limiting regulation which will be difficult for operators (and ATC) to adhere to and could present a potential safety hazard if implemented. Radar vectors, conflicting traffic, weather avoidance etc. is part of normal and everyday operation of an aircraft. SET-IMC aircraft must be able to adhere to the normal arrival and departure flows from airports without the constraints of always being in a position to reach a landing site. (c) En-Route Impractical and limiting regulation which will be difficult for operators (and ATC) to adhere to and could present a potential safety hazard if implemented. Icing conditions, atmospheric disturbances, thunderstorms or other instances where the flight crew need to alter route or altitude must be possible and still be in compliance. Icing conditions and the C208 for instance is a major issue and is always more unsafe than the possibility of loosing an engine in an extended risk period due to a level change because of in-flight ice.	
response	Partially accepted. AMC1 SPA.SET-IMC.105(d)(2) has been amended to clearly state that appropriate SIDs have to be selected to the extent possible. In any case, it should be noted that the operator can still make use of a risk period if no landing site is available.	

comment	*136*	comment by: *Daniel HUNN*
	It is well known that the majority of accidents occur during take-off and landing. For this reason, it is not appropriate to allow operator to include these phases of flight in any risk period. More specifically, in terms of take-off and landings in RVRs of 550m, it seems highly optimistic to assume that any departure and arrival procedures will allow successful forced landings from low height in those sort of visibilities within the inevitable short time available	

	to react effectively. Consequently, the idea of IMC operations to such low weather minima is inappropriate.
response	Not accepted. Please refer to the Explanatory Note of NPA 2014-18 for the rationales of the proposed requirements. Regarding take-off minima, the draft resulting text has been modified to introduce a minimum RVR value of 800 m for such operations.

3. Proposed amendments — ED Decision 2012/019/R — Part-SPA — GM1 SPA.SET-IMC.105(d)(2) p. 22

comment	*67* comment by: *CAA-NL* **GM1 SPA.SET-IMC.105(d)(2)** We suggest to change the sentence as follows: A landing site is an aerodrome or an area where a safe forced landing can be performed by day or night **in all weather conditions**. To be sure that also in IMC conditions the landing side is appropriate, as stated in SPA.SET-IMC.105(d)(3)
response	Not accepted. While the intent of this comment is understood, the proposed modification is not considered acceptable as it introduces a too stringent requirement. It is, indeed, considered that a landing site is acceptable for specific flights depending on the weather conditions during that day as stated in AMC1 SPA.SET-IMC.105(d)(2)(c)(4). The content of GM1 SPA.SET-IMC.105(d)(2) has been slightly amended to reflect this.

comment	*70* comment by: *Daniel HUNN* The Guidance Material section should be much more specific about the required characteristics of a landing site. This is probably the most important mitigation for this type of operation and, aside from airfields, could be very subjectively assessed in terms of surface characteristics, obstacles, weather minima and wind direction & speed.
response	Accepted. To address this specific issue, some guidance has been introduced into the draft resulting text to provide information to the operator on the criteria to be considered when assessing a

landing site.

3. Proposed amendments — ED Decision 2012/019/R — Part-SPA — GM2 SPA.SET-IMC.105(d)(2) p. 22

comment *4* comment by: *VOLDIRECT*

SAFETY RISK ASSESSMENT

"The operator may decide to further assess some specific routes and therefore to conduct a specific risk assessment to evaluate the associated risk and determine if additional mitigation could be needed"

The objective of a specific route assessment is not only to *determine if additional mitigation could be needed,* but also to assess the calculated risk factor on a specific route, enabling the operator to exceed the 15 minutes value if he demonstrates that the risk for the flight is under a defined target (see below).

The wording should be:

"The operator may decide to further assess some specific routes and therefore to conduct a specific risk assessment to evaluate the associated risk and determine if additional mitigation could be needed, or if the risk period may be extended for this particular route."

(c) When assessing the risk in each segment, the height of the engine failure, the position relative to the departure or destination airfield or to an emergency landing site en route, as well as the likely ambient conditions (ceiling, visibility wind and light) should be taken into account

We agree, but the actual engine reliability (as defined in SPA.SET-IMC.105) should be used for the calculations, and not the minimum standard 1E-5 value.

The new wording should be:

(c) When assessing the risk in each segment, the actual turbine engine reliability (cf. SPA.SET-IMC.105), the height of the engine failure, the position relative to the departure or destination airfield or to an emergency landing site en route, as

well as the likely ambient conditions (ceiling, visibility wind and light) should be taken into account .

(d) The duration of each segment determines the exposure time at that estimated risk. By

	summing the risk for all individual segments, the cumulative risk for the flight due to engine failure can be calculated and converted to a 'per flight hour' basis. This is a good method. In order to clarify, the target could be taken out of the KINETIC study (value = 1.3E-6). See § 2.2.8 in QINETIQ study: **In summary the WG recommends that the SET target rate for fatal accidents following a propulsion system failure should not be greater than 33% of the overall target of 4.0 x 106 pfh, i.e. 1.3 x 106 pfh.** The proposition is to add this sentence in the GM2: *The SET target rate for fatal accidents following a propulsion system failure should not be greater than 1.3 x 106 pfh.*
response	Partially accepted. GM2 SPA.SET-IMC.105(d)(2) has been almost fully amended and introduces in a clearer way the intent of the risk assessment together with the target safety rate.

comment	*42* comment by: *IAOPA Europe* Regarding the AMCs to SPA.SET-IMC.105(d)(2) and the 15 minutes 'out-of-gliding distance' limitation, IAOPA believes that some more flexibility is required. For instance it could be a percentage of the expected flight time. For instance 15 percent or 15 minutes whichever is more. AMC 1 has the 15-minute limitation under the headline of "Planning", but it should be made even more clear that such limitations are strictly for planning purposes. Operationally, a flight might have to enter a holding and follow radar vectors and must be allowed to do so without a rigid system where minutes 'out-og-gliding distance' must be counted. Operationally the pilot must take reasonable measures to reduce the time where gliding to a landing cannot be achieved to a minimum.
response	Partially accepted. The Agency recognises that the risk level could be managed appropriately for flights with risk periods of more than 15 min per flight. It is as well acknowledged that this 15-min limit might lead to operational practices adding additional risks. Therefore, the draft resulting text has been amended to provide a possibility to extend the risk period available, based on a risk assessment to be established by the operator for the specific route concerned.

comment	*84* comment by: *On behalf of Highlands and Islands Airports Ltd* It should be made very clear here that the operator does not need to make a specific risk assessment for any route as it can follow the route planning procedures approved as part of its CAT SET-IMC approval.
response	Accepted. This is, indeed, the intent of the proposed text. A risk assessment for a specific route is required only if the operator wants to make use of a risk period of more than 15 min for a certain flight.

comment	*93* comment by: *Nordflyg* ORO.GEN.200 already regulates safety risk assessment and therefore the need for further regulatory framework is not necessary. SET-IMC should be incorporated in the existing management system as described by ORO.GEN.200.
response	Not accepted. Indeed, any risk assessment is made by an operator within the frame of its management system, which is regulated in ORO.GEN.200. Nevertheless, for consistency reasons and practicality, it is considered more appropriate to keep the guidance for this specific risk assessment in Subpart L (SET-IMC) of Annex V (Part-SPA). AMC1 SPA.SET-IMC.105(d)(2) has been slightly amended in the draft resulting text to clearly state that this risk assessment is part of the operator's management system.

comment	*108* comment by: *UK CAA* **Page No:** 22 **Paragraph No:** GM2 SPA.SET-IMC.105(d)(2) SET-IMC operations Safety Risk Assessment **Comment:** The SRA in paragraph (a) appears to define a successful landing as one with 'no damage or injuries sustained'. The 'no damage' element is neither practical nor necessary as the aircraft structure will absorb a degree of energy on landing sustaining damage whilst protecting the occupants. **Justification:** This definition appears to be at variance with the ICAO definition of a 'safe' forced landing given in page 123, 6.2, Note 1, which implies the aeroplane may incur extensive damage.
response	Accepted. The draft resulting text has been modified accordingly.

comment	*138* comment by: *Daniel HUNN* Allowing operators to carry out their own risk assessments of their routes is not appropriate. Many of these companies will be operating economically challenging routes and will inevitably suffer an 'optimism bias' to allow favourable routes to be flown. It is essential that oversight in these areas is strongest.
response	Not accepted. This is already considered to be appropriately addressed in the current regulation. Indeed, in any case, the operator's management system including its safety risk management process is subject to the oversight of the CA. In addition, as stated in ARO.GEN.305, the establishment of the oversight programme by the CA shall be based on the specific nature of the organisation, the complexity of its activities, the results of past certification and/or oversight activities required by ARO.GEN and ARO.RAMP, as well as on the assessment of associated risks.

3. Proposed amendments — ED Decision 2012/019/R — Part-SPA — AMC1 SPA.SET-IMC.110(f) p. 23

comment	*30* comment by: *Swedish Transport Agency, Civil Aviation Department (Transportstyrelsen, Luftfartsavdelningen)* AMC 1 SPA.SET-IMC.110 <u>Original text:</u> AMC1 SPA.SET-IMC.110(f) Additional equipment requirements for CAT SET-IMC operation AREA NAVIGATION SYSTEM An acceptable standard for the area navigation system is the European technical standards order ETSO-145/146c, ETSO-C129a, ETSO-C196a or ETSO-C115 issued by the Agency or equivalent. <u>Suggested text:</u> AMC1 SPA.SET-IMC.110(f) Additional equipment requirements for CAT SET-IMC operation AREA NAVIGATION SYSTEM An acceptable standard for the area navigation system is the European technical standards order ETSO-145/146c, ETSO-C129a, ETSO-C196a or ETSO-C115 issued by the Agency or

	equivalent, and should include vertical guidance for both operator selected landing sites and aerodromes. Discussion: Since landing sites are a new concept and the pilots needs to be able to perform a power off landing in IMC to the landing site, the equipment has to be able to give the guidance needed for this type of operation. The vertical guidance will become necessary in a critical situation, i.e. power off landing on a landing site in poor weather. The suggested text clarifies the specific need for vertical guidance to landing sites, without excluding the vertical guidance to aerodromes. Conclusion: Add an extra requirement regarding vertical guidance and landing site programming.
response	Not accepted. There are currently no certification standards available for such functionality and, therefore, this cannot be mandated without such standards. In any case, it is currently considered that the equipment required in the proposed text provides enough support to the pilot to be able to reach a selected landing site following an engine power loss.

3. Proposed amendments — ED Decision 2012/019/R — Part-SPA — AMC1 SPA.SET-IMC.110(l) p. 23

comment	*5* comment by: *VOLDIRECT* *Examples of elements affecting pilot's vision for landing are rain and window fogging.* There is no SE-IMC airplane equipped with a windshield wiper. Also, if the engine is not operative, no hot air will be available for removing the fogging. *In practice, this requirement should be removed.*
response	Partially accepted. The draft resulting text has been amended to state that windshield wipers have to be powered only of course if they are currently installed in the aeroplane concerned.

comment	*20* comment by: *VOLDIRECT* The following text should be added as follows:

	SPA.SET-IMC.115 SET IMC Take-off minima *The take-off RVR/visibility specified by the operator should be expressed as RVR/VIS values not lower than those specified in Table 1.A from* AMC CAT.OP.MPA.110.
response	Partially accepted The Agency acknowledges that there were no specific provisions in NPA 2014-18 related to take-off minima for CAT SET-IMC operations. Taking into consideration the reliability of the engine concerned, the Agency considers that a minimum RVR value of 800 m is appropriate for CAT SET-IMC operations, in comparison to the higher RVR requirement for multi-engined aeroplanes which may need to reland immediately in the event of a critical engine failure during take-off (up to 1500 m depending on the height at which the engine failure occurs). An amendment to AMC1 CAT.OP.MPA.110 to reflect this has been introduced in the draft AMC and GM provided in this CRD.

comment	*158* comment by: *BENAIR* Re. RVR/VIS on take-off, EU-OPS sets standards for multi-engine aircraft. The NPA should clearly point at the paragraph to refer to define the applicable RVR/VIS on takeoff for SET IMC operations, i.e.table 1.A in AMC CAT.OP.MPA.110
response	Partially accepted The Agency acknowledges that there were no specific provisions in NPA 2014-18 related to take-off minima for CAT SET-IMC operations. Taking into consideration the reliability of the engine concerned, the Agency considers that a minimum RVR value of 800 m is appropriate for CAT SET-IMC operations, in comparison to the higher RVR requirement for multi-engined aeroplanes which may need to reland immediately in the event of a critical engine failure during take-off (up to 1500 m depending on the height at which the engine failure occurs). An amendment to AMC1 CAT.OP.MPA.110 to reflect this has been introduced in the draft AMC and GM provided in this CRD.

4. RIA — 4.1. Issues to be addressed — 4.1.1. General issues p. 24-25

comment	*48* comment by: *ECOGAS/SVFB/SAMA* It's positive, that EASA which first priority is safety, takes economy into consideration as well.
response	Noted.

4. RIA — 4.1. Issues to be addressed — 4.1.2. Safety risk assessment p. 25-27

comment 26 comment by: *Swedish Transport Agency, Civil Aviation Department (Transportstyrelsen, Luftfartsavdelningen)*

NPA 2014-18, 4.1.2.2 CAT SET-IMC operations fatal accident rate

Original text:

The scope of this study is the operations of light twin turboprop aeroplanes and single-engined turboprop aeroplanes in the USA and Canada from the introduction of the aeroplanes until 2010 and includes all commercial and non-commercial operations. In order to have a more representative sample, only the period 2005-2010 was considered and it showed a fatal accident rate of 3.96/million flight hours for light twin turboprop aeroplanes and 5.61/million flight hours for single-engined turboprop aeroplanes. In addition to that, if within the single turboprop aeroplanes category, we consider only the 3 main types that are expected to be able to currently meet the NPA OPS 29 Rev 2 requirements, Cessna C208, Pilatus PC-12 and Socata TBM700/850, the resulting fatal accident rate is 4.44/million flight hours.

Since these figures are based on the same sample and area of operations, it can be concluded that the current safety rates of twin turboprop aeroplanes and single turboprop aeroplanes are in the same range and close to the value of 4/million flight hours, which was the QINETIQ recommended target fatal accident rate.

This target fatal accident rate of no more than 4 per million flight hours has been selected as a basis for the drafting of this NPA.

Suggested text:

No suggestion. The text should still be revised.

Discussion:

The statistic shows a fatal accident rate of 5.61/million flight hours in single-engine turboprop aeroplanes, but only the three types Cessna C208, Pilatus PC-12 and Socata TBM700/850 are considered which gives a fatal accident rate of 4.44/million flight hours.

It is quite likely that other types of single engine turboprop aeroplanes will be flown in this type of operation and then the fatal accident statistics goes up by 42 % to 5.61/million flight hours.

The regulators needs to look at the causes of accidents in the past, as well as coming technical solutions, in order to mitigate the risks and thereby approach the fatal accidents target number of 4/million flight hours. Examples may be dual pilots, higher requirements on vertical guidance, autopilot, minimum RVR/VIS.

	Conclusion: The real risk of fatal accidents in single engine turbo-prop operations today is 5.61 per million flight hours and more mitigations should be considered in order to approach the target value of 4 fatal accidents/million flight hours.
response	Not accepted. PC12, CESSNA208 and TBM700/850 are the three aeroplane types which are currently known to be potentially eligible for CAT SET-IMC operations. There might be other aeroplane types eligible, such as the Piper Meridian, but in any case, the other potentially eligible aeroplane types represent in the data used only a very limited number of hours and, therefore, this does not cause any variation to the rate considered for the three types above.

comment	*49*	comment by: *ECOGAS/SVFB/SAMA*
	Risk based principles evolving from theory into practice: a real progress.	
response	Noted.	

comment	*58*	comment by: *Piper Aircraft Inc.*
	Piper Aircraft disagrees with this random sampling of aircraft as stated in this section based on NPA OPS 29 rev 2. This JAA NPA was published in 2004, with development of these requirements beginning in 2001. EASA has failed to increase the “randomized” sampling to include current production aircraft that were detailed in NPA OPS 29 Rev 2 as newly certificated or aircraft currently in development. EASA failed to take into account in the arbitrary sampling time frame between the development of NPA JAA OPS 29 Rev 2 and the development of NPA 2014-18. Piper Aircraft disagrees based on the criteria for establishing the target fatal accident rate of no more than 4 per million flight hours being an arbitrary and artificial barrier of entry for CAT SET operations based upon a less than approximate average of light twin turboprop and an arbitrary selection of SET aircraft fatal accident rates. The selected rate would even preclude at least one of the three arbitrarily selected SE models that make up the average. We recognize that CAT SET-IMC operations would be operated by professional flight crew that will meet a higher standard of proficiency and skill. The method to determine the fatal accident rate should be based on similar commercial operations which would be limited to professional pilot error or airframe/engine combination failures and preclude non-mechanical, non-professional pilot error, or other non-airframe/engine failure (ie weather, terrain/obstacle Collison, etc.) which should apply equally to single and multi-engine airplanes. Additionally, Piper Aircraft believes the Breiling report to be bias by not distinguishing	

between commercial and non-commercial operations. The original 2010 report appears to be commissioned by and for a specific aircraft OEM. The statistics used fails to distinguish between fatal accidents caused by pilot error or other non-aircraft/engine failures (ie weather, terrain, obstacles, etc) versus airframe/engine combination failures. In reviewing the published NTSB probable causes (limited to fatal accidents for the PA-46-500TP) there were no fatal accidents attributed to airframe/engine failures. We believe the risk factor should be based on the safety factor of the airframe/engine combination and exclude accidents caused by pilot error.

response

Not accepted.

In any case, the 4/MFH target fatal accident rate is not designed to be an eligibility criterion and does not represent any barrier for a new aeroplane to be qualified for CAT SET-IMC operations.

There is no list of eligible aircraft for CAT SET-IMC operations established by the Agency. It will be, in any case, up to each CA to determine whether a specific aeroplane type is eligible for such operations. The Agency has considered PC12, CESSNA208 and TBM700/850 in the statistics since they are the three main aeroplane types which are currently known to be potentially eligible for CAT SET-IMC operations. There might be other aeroplane types eligible, such as the Piper Meridian, but in any case, the other potentially eligible aeroplane types represent in the data used only a very limited number of hours, and this is why only the three types above have been taken into consideration.

comment

109 comment by: *UK CAA*

Page No: 25

Paragraph No: 4.1.2.2 CAT SET-IMC operations - Fatal accident rate.

Comment: The NPA proposes a target fatal accident rate (all causes) of no more than 4 per million flight hours. It is not clear how this is considered appropriate when compared to the target level of safety defined in FAA AC 23.1309-1E

Justification: The RIA needs to better explain the reasoning for the revised safety targets.

response

Not accepted.

In any case, operational safety targets cannot be compared to the certification safety target, as the latter encompasses many other parameters, and, as a consequence, they are always higher.

comment

133 comment by: *Glass Eels Ltd*

Attachment #2

Comment:

The objectives of the risk assessment are commendable but since the numerical methodology is atypical of those generally used within the aerospace sector and lacks a clear approach to validation, it also fails to come to any robust numerical conclusion. It is suggested that the general approach might better have been to first model the risk without the mitigations proposed by the NPA and to validate this baseline risk model against the available data for the fatal accident rate due to engine failure. The next step would be to use this validated model to predict the impact of the mitigations. A fault tree analysis (FTA) would be a recognised modelling tool for this work. A weakness of the scenario approach is that it relies upon the risk factors being mutually exclusive and some "double dipping" is noted in the comments below. A simple numerical check that the sum of the escalation factors equals unity (ie the scenarios do not overlap giving an effective engine failure rate greater than the data value of 10 per million) gives a result of 166%. This is not necessarily invalid but indicates there are interactions between the scenarios that need to be understood. The scenario analysis has been reworked as an FTA. See attachment.

The conclusions of the FTA are:

1. The unmitigated risk model of the fault tree is an acceptable over estimate of the fatal accident rate compared with the historical data. This considered a reasonable validation of the data presented in the scenarios of Appendix A of NPA 2014-18.
2. The target fatal accident rate as a result of engine failure is predicted to be achievable with recourse to the use of a 15 minute risk period or an appeal to the Engine Failure rate being less than the reference value of 10 per million hours used throughout the NPA.. The mitigated fatal rate is predicted to be 2.8 per million flight hours.

response Accepted.

We thank you for this very valuable input. The Safety Risk Assessment (SRA) initially published in NPA 2014-18 has been updated and included for information in the Opinion.

4. RIA — 4.1. Issues to be addressed — 4.1.3. Who is affected? p. 27-29

comment 6 comment by: *General Aviation Manufacturers Association / Hennig*

The General Aviation Manufacturers Association (GAMA) appreciates EASA moving forward with the NPA to establish a regulatory framework for the use of single engine turbine aeroplanes in Commercial Air Transport (CAT) operations in IMC and at night. Europe is today the last remaining region in the world that does not provide a regulatory framework for CAT SET-IMC operations.

The debate about SET-IMC operations has been underway in Europe for close to two decades during which time European operators have been faced by regulatory uncertainties. These uncertainties have contributed to the decline in the fleet of SET-IMC operations in Europe while this type of aircraft fleet and operations have grown in other parts of the world including the United States as shown in the section 4.1.3.2 data analysis.

It is important that this rulemaking be completed to establish an appropriate regulatory framework for SET-IMC in Europe to provide the necessary safety requirements to facilitate the utility of these types of operations for passenger and cargo operations in Europe including smaller communities and remote areas.

response Noted.

comment _25_ comment by: _DGAC France_

In table 4 of paragraph 4.1.3.2 (page 29), "Aviation Sans Frontières" has been included among operators being allowed to conduct SET in IMC or at night by the French DSAC.

for the time being "Aviation Sans Frontières" has not been granted any derogation to operate such flights.

response Noted.

The Agency takes note of this correction. The table contained in NPA 2014-18 is, in any case, not reproduced in the Opinion.

comment _50_ comment by: _ECOGAS/SVFB/SAMA_

We support the process of taking into consideration the vast experience gained in other regions, like the US.

This approach based on high number of valid data helps here and can help in other subject to acclelerate introduction of progressive technologies.

(GPS approaches in uncontrolled airspace **G** would be another area, where the US has a vast database to accelerate the process of approving use of such approaches on many airfields with a huge safety impact)

response Noted.

comment	*68* comment by: *CAA-NL* **RIA para 4.1.3.1/2** We are wondering how the conclusion stated in the last sentence of 4.1.3.1: 'It can be, therefore, concluded that a potential for a possible development of the fleet of single-engined aeroplanes exists in Europe if rules allowing CAT SE-IMC are published.' can be matched with the diminishing figures of this option in those countries where it is now already possible. As stated in the table of 4.1.3.2, the number of operators went from 10 to 8 between 2005/6 and 2013 and the number of aircraft used from 32 to 13. Might it be the case that these operations are economically not viable?
response	Not accepted. In any case, it has to be considered that CAT SET-IMC operations are currently forbidden in Europe, except for those operators to which a derogation has been granted, and this is, therefore, why the presented numbers in the table are rather decreasing. Indeed, some Member States, in the absence of European regulations on CAT SET-IMC, are currently not willing to possibly grant such a derogation to their operators.

4. RIA — 4.1. Issues to be addressed — 4.1.4. How could the issue/problem evolve? p. 29-30

comment	*14* comment by: *Pilatus* Pilatus believes there is an inconsistency in the first paragraph. It should not state "better environmental impact than the single-engined turbine aeroplanes" but rather "worse environmental impact" since twin engine aircraft have a worse environmental footprint.
response	Accepted. This has been corrected in the summary of the RIA contained in the Opinion.

comment	*51* comment by: *ECOGAS/SVFB/SAMA* Here as well we commend EASA for taking the lesser regulated but well working experience and declaring it as a model to follow under well controlled consideration. This approach, seldomly seen applied in past NPA's, is for sure promoting and acceleratin

	technological progress. Better technology in turn will benefit safety.
response	Noted.

4. RIA — 4.3. Policy options — 4.3.1.Option 1 description p. 30-33

comment	_152_ comment by: _Finnish Transport Safety Agency_ The take-off minima requirements should be clearly stated for the single-engined aeroplanes. These provisions should take into account available facilities, possible performance limitations and scenarios for engine failure. At the moment the minimum take-off RVR for the single-engine IMC or night operations is 800m in Finland.
response	Accepted. The Agency acknowledges that there were no specific provisions in NPA 2014-18 related to take-off minima for CAT SET-IMC operations. Taking into consideration the reliability of the engine concerned, the Agency considers that a minimum RVR value of 800 m is appropriate for CAT SET-IMC operations, in comparison to the higher RVR requirement for multi-engined aeroplanes which may need to reland immediately in the event of a critical engine failure during take-off (up to 1500 m depending on the height at which the engine failure occurs). An amendment to AMC1 CAT.OP.MPA.110 to reflect this has been introduced in the draft AMC and GM provided in this CRD.

4. RIA — 4.3. Policy options — 4.3.3.Option 3 p. 35-41

comment	_73_ comment by: _Daniel HUNN_ In reference to the Qinetic reference 12.1/9.1 it seems strange to not require a risk assessment methodology because it is too complex. These, by their very nature will be complex operations and should be exposed to the full rigour of assessment.
response	Not accepted. When drafting a regulation, the Agency has to ensure that the proposed requirements are proportionate. This specific risk assessment methodology was proposed by QINETIQ, to be used by all operators for each route to be flown by an operator, rather than the use of a limit to the

total risk period of the flight.

The use of such methodology for all routes was considered inappropriate for small operators and, therefore, it has been proposed to keep the 15-min risk period duration limit and allow operators to possibly extend this 15-min risk period by establishing a risk assessment of the route concerned, using the QINETIQ methodology, to ensure that the risk of fatal accident remains at an acceptable level.

comment | *75* | comment by: *Daniel HUNN*

In terms of crew compostition, as a pilot in a multi-crew operation, it is a nonsense to suggest a second pilot would have no positive impact on flight safety. An IMC forced landing will be one of the most challenging exercises any pilot may have to carry out. Clearly, a second pilot would be able to carry out checklists and assist with navigation during the descent. Not only should a second pilot be carried for this type of operation but the company should be required to define emergency procedures and ensure effective CRM is trained to define task sharing during normal and non-normal operations.

response | Partially accepted.

As indicated in the Explanatory Note to NPA 2014-18, the fatal accidents database for SET aircraft with engine involvement was reviewed and it was concluded that in almost all cases a second pilot would not have helped. One of the main cause identified was related to the lack of flight preparation, leaving the flight crew insufficiently prepared to manage an emergency situation following a power loss. However, the Agency acknowledges that while a requirement for a second pilot is not in general appropriate (aircraft single-pilot certified, consistency with the light twins' possibility to be operated in CAT with one pilot in IFR), in the case of flight crew with limited experience of such operations, a second pilot could provide an efficient mitigation to manage the additional workload and pressure.

The resulting text of SPA.SET-IMC. 105 has been amended to include experience criteria for flight crew for single-pilot operations.

comment | *76* | comment by: *Daniel HUNN*

Not requiring route specific risk assessments because of the 'burden on operators and the competent authority' is a clear example of commercial expediency over safety.

response | Not accepted.

Please refer to the response to comment No 73.

comment	*77* comment by: *Daniel HUNN* Landing distance factors are not being required because they may preclude some landing sites. Given that, as proposed, a single pilot may be attempting an IMC forced landing at night in very poor weather (minima not clearly defined) whilst, simultaneously, navigating and carrying out checklists, it is impossible to think that the pilot will cross 'the hedge' at a perfect 50'. Therefore, a landing distance factor is highly appropriate for all landing sites. If they preclude any particular landing sites, then it could be concluded they were not suitable for a 'safe landing' in any event.
response	Not accepted. Considering the various possible characteristics of landing sites, it is not considered appropriate to establish such a landing distance factor. It is rather proposed to require the operators to assess landing sites allowing a safe forced landing with a reasonable expectation of no injuries to persons in the aeroplane or on the ground. It is, therefore, up to the operator, based on all the information related to the landing site (landing distance, but also surface type, obstacles, weather conditions, etc.), to determine whether a safe forced landing can be conducted in case of an engine failure. To support this assessment, some guidance on the criteria to be considered when assessing a landing site has been introduced into the draft resulting text.

comment	*135* comment by: *Daniel HUNN* Lack of planning minima for landing sites: It is accepted that weather information will not be available for many landing sites. However, the use of area forecasts (cloudbase & visibility) coupled to conservative planning minima (perhaps 3000' ceiling and 5km visibility) would make the operation a lot safer. If the area forecast does not give confidence in achieving this, then a longer (safer) route will be required. Using a conservative figure as a backstop would not preclude the setting of lower minima for specific site should the operator wish to invest in the survey and inspection work required. However, in the absence of this, a more conservative approach of a basic set of minima would be appropriate.
response	Not accepted. Depending on the landing site selected, such generic high minima are considered overprescriptive. It is considered that it is up to the operator to assess the prevailing weather information on the selected landing site to determine whether it allows a safe forced landing to be conducted. This is considered to be part of the general risk assessment of its SET-IMC operations integrated in its management system.

4. RIA — 4.4. Methodology and data p. 42-50

comment	*52* comment by: *ECOGAS/SVFB/SAMA* A very valuable lecture about methodology used, probably one of the reasons for the positive impression of this whole NPA.
response	Noted.

comment	*53* comment by: *ECOGAS/SVFB/SAMA* As mentioned above, using global data to have a better base for sound decision is an exemplary approach.
response	Noted.

comment	*110* comment by: *UK CAA* **Page No:** 43 **Paragraph No:** Table 8, Scores for the multi-criteria analysis **Comment:** UK CAA believes the term 'savings in **turnover**' is the incorrect term, and that it should be 'savings in **expenditure**'. **Justification:** The definition of 'turnover' for a company is 'The amount of business it conducts during a year, usually measured through income or sales'. From www.investorwords.com **Proposed Text:** UK CAA suggests use 'Savings of more than n% in annual expenditure', for the positive scores and 'Increases of n% in annual expenditure' for the negative scores.
response	Accepted. This table will be updated in future RIAs to be developed by the Agency.

comment	*111* comment by: *UK CAA* **Page No:** 43 onwards and 83 **Paragraph No:** 4.4.2 and Appendix A Safety Risk Assessment **Comment:** The RIA appears to take a fundamentally different approach to the assessment of

	safety and the risk analysis process that has been used within the aircraft certification domain for a considerable period of time. The type certification process defines what is an acceptable level of safety and drives the design to assure that the aircraft can, within these probability boundaries, make safe flight and landing and thus protect crew/passengers and persons on the ground within the operational envelope defined, The operating and environmental conditions that could reasonably be expected to be encountered must be considered in this assessment, reference FAA AC 23.1309-1E paragraph 12. **Justification:** The type certification process should have already considered all reasonably foreseeable failure conditions, the operational scenarios considered in the NPA do not always result in the worst case scenario. It is therefore likely that the factors being added in the RIA may have already been included / considered in some way within the type certification safety assessment process. Where new capability, such as different types of operation, is to be introduced the certification process would typically be revisited, and if necessary design changes introduced to address potential shortfalls in safety targets, e.g. improved equipment fit, alternate maintenance regimes to assure reliability targets, new or modified operation instructions (AFM procedures). This approach does not appear to feature within the NPA, yet is the typical method to support specialised operations.
response	Not accepted. In any case, SET-IMC operations is an operational issue as eligible aeroplanes are certified to be flown commercially in IMC. In addition, operational safety targets cannot be compared to the certification safety target, as operational safety targets encompass many other parameters, and, as a consequence, are always higher.

4. RIA — 4.5. Analysis of impacts — 4.5.1. Safety impact	p. 51-60

comment	*112* comment by: *UK CAA* **Page No:** 59 **Paragraph No:** Impact option 3 **Comment:** UK CAA believes the calculation for option 3 is incorrect **Justification:** Impact NPA OPS29 = 1, SUM(all individual impact) = 3 and the total number of recommendations for option 3 is 6 making the calculation 1 + 3/6 = 1.5 **Proposed Text:** Impact option 3 = impact NPA OPS29 + SUM(individual impact)/6 = 1 + 3/6 =+

	1.5
response	Accepted. The SRA has been accordingly updated in the Opinion.

comment	*151* comment by: *Finnish Transport Safety Agency* Finnish Transport Safety Agency proposes that when carrying passengers minimum crew of two pilots is required due to challenging operational environment, both in high density airspace and in hostile environment. The other option could be crew of one pilot with high performance autopilot capable to cover different kinds of emergency and abnormal conditions.
response	Partially accepted. As indicated in the Explanatory Note to NPA 2014-18, the fatal accidents database for SET aircraft with engine involvement was reviewed and it was concluded that in almost all cases a second pilot would not have helped. One of the main cause identified was related to the lack of flight preparation, leaving the flight crew insufficiently prepared to manage an emergency situation following a power loss. However, the Agency acknowledges that while a requirement for a second pilot is not in general appropriate (aircraft single-pilot certified, consistency with the light twins' possibility to be operated in CAT with one pilot in IFR), in the case of flight crew with limited experience of such operations, a second pilot could provide an efficient mitigation to manage the additional workload and pressure. The resulting text of SPA.SET-IMC. 105 has been amended to include experience criteria for flight crew for single-pilot operations.

4. RIA — 4.5. Analysis of impacts — 4.5.3. Social impact p. 63-64

comment	*54* comment by: *ECOGAS/SVFB/SAMA* Being aware that the Agencies first priority is safety, we rate it positive as well as needed, that the importance of job creation has found it's way into this NPA.
response	Noted.

4. RIA — 4.5. Analysis of impacts — 4.5.4. Economic and proportionality impact p. 64-73 comment | *15* comment by: *Pilatus*

§4.5.4.2 Compliance cost:

The paragraph states that compliance costs will be minimal, however, if the requirement embraces Full Flight Simulation [level D] then the cost to the operator may be significant.

A FFS needs 1.5 - 2 years development time and costs around USD 10million and in addition the hourly rate charges will depend on the degree of capacity utilization and number of possible customers, therefore the economic impact suggested within this paragraph is questionable.

response | Not accepted.

In any case, the intent was not to possibly require operators to invest in an FFS. The draft resulting text has been amended to clearly state that a simulator has to be used for the training/checking when there is one available to the operator.

comment | *55* comment by: *ECOGAS/SVFB/SAMA*

We appreciate very much the considerations and the effort invested by the agency to take note of **SME's.**

response | Noted.

6. Appendices — 6.1. List of abbreviations p. 81-82

comment | *148* comment by: *General Aviation Manufacturers Association / Hennig*

The List of abbreviations in 6.1. identifies "STOL as Short Take-Off and landing Aircraft".

GAMA notes that this term is not used in any relevant way within the rest of the NPA. The STOL term is also not further defined.

GAMA recommends that the STOL term is removed from the list of abbreviations.

response | Accepted.

The list of abbreviations has been updated accordingly.

6. Appendices — 6.2. Appendix A: Safety risk assessment p. 83-91

comment | *19* comment by: *VOLDIRECT*

The scenario 2 is based on a 800 m RVR.

It shows a probability of (2,28-1,25)x10 -7 X 24 % = =2,47x10 -8.

The probability calculated is the one related to an RVR between 1 500 m and 800 m in AMS.

For a RVR between 1 500 m and 800 m, the probability will be vene lower: assume (2,28-1,50) x 10E-7.

The new risk assessment becomes: (2,28-1,50) x 10E-7 * 24% = 1.87 E-8.

This value is well under the acceptable risk threshold.

The conclusion reads:

Conclusion:

It is considered that a RVR value above 800 m should provide the flight crew with equivalent chances to perform a successful emergency landing right after the take-off compared to a VFR flight. Therefore, it is considered that no additional mitigation is needed.

This minimum value of 800 m does not reflect the low risk value.

The text should read:

Conclusion:

Given the risk assessment, it is considered that no additional mitigation is needed.

response | Partially accepted.

The general intent of this comment is shared. Nevertheless, it is considered that for an RVR value lower than 800 m, some mitigation is necessary taking into account the very limited time available to the pilot to react in case of an engine power loss. Therefore, the draft resulting text has been amended to mention that an RVR value lower than 800 m can be used provided that the surface in front of the runway allows for a safe forced landing to be conducted.

comment | *113* comment by: *UK CAA*

Page No: 83

Paragraph No: Throughout Appendix A Safety risk assessments

Comment: It is not easy to follow the process of assessing the residual risk which looks to have been carried out in different ways over the 8 scenarios.

Justification The results cannot be reproduced without the values of each mitigation.

Proposed Text: UK CAA recommends there should be a value assigned to each mitigation in order to be able to see the calculation for the residual risk. Also, it should be demonstrated that the inclusion of these mitigations is sufficient

response

Accepted.

The risk assessment has been accordingly amended and included for information in the Opinion.

comment

_114_ comment by: _UK CAA_

Page No: 83

Paragraph No: Throughout Appendix A Safety Risk assessments

Comment: Best practice is to give results in the same format; in this case they should all be to the same power.

Justification: Consistency.

Proposed Text: The results should be written as either ‘n x 10^{-7}’ or ‘n x 10^{-8}’

response

Accepted.

The risk assessment has been accordingly amended and included for information in the Opinion.

comment

_115_ comment by: _UK CAA_

Page No: 83

Paragraph No: Appendix A Safety Risk Assessment

Comment: Without prejudice to previous comments, the UK CAA recommends that the risk assessments should be reviewed and revised to better reflect the overall risk picture and how the different aspects work in isolation or combination to affect the overall risk.

Specific data appears to be used without adequate consideration to the overall risk picture. For example, the “JAA estimated on fatal accident rate following a forced landing” figure of 12% is used without reference to the implications of allowing Night/IMC operations and/or the use of risk periods.

Justification: The achievement of a safe forced landing is dependent on a number of factors which independently or in combination will contribute to the likelihood of the outcome. For example, whether the aircraft is flying without the ability to reach landing site, (i.e. a within a risk period), has adequate altitude/time to configure for best glide performance, make

	landing configuration changes, has adequate visibility due to cloud base minima, or other weather and light conditions at the time all come together in one scenario. The risk assessment model of each scenario must be seen to be realistic and defensible.
response	Partially accepted. The SRA has been accordingly updated and included for information in the Opinion. It provides more rationales regarding the figures coming from the JAA as well as an evaluation of the possible combinations of scenarios with the use of a Fault Tree Analysis (FTA).

comment	*116* comment by: *UK CAA* **Page No:** 86 **Paragraph No:** Scenario 3 Low visibility. **Comment:** It is unclear how an RVR at a landing site can be linked to an average value for an unrelated point within Europe. Nevertheless, assuming a 100 knot glide speed, the proposed 550 metres visible segment would be covered in less than 11 seconds and this would be a challenging allowance for a normal flare unless it was on to a very well lit runway and the aircraft is in the correct approach path position. This would be a demanding task for a pilot of average skill. **Justification:** The probability of achieving this following an engine failure must be considered extremely low in the safety analysis.
response	Accepted. The rate for unsuccessful forced landing for this specific scenario has been increased to address this concern. It should be noted, nevertheless, that a successful safe forced landing is considered to be any forced landing with no fatalities. It could, therefore, include damages to the aeroplane and injuries to the passengers, hence, it cannot be directly compared with a forced landing on a well illuminated runway.

comment	*117* comment by: *UK CAA* **Page No:** 87 **Paragraph No:** Scenario 4, ‘Residual risk evaluation’ column **Comment:** UK CAA believes the answer given is incorrect. **Justification:** 4.65×10^{-6} * 12% = 5.58×10^{-7} **Proposed Text:** The answer should be 5.58×10^{-7}

response	Accepted. The risk assessment has been accordingly amended and included for information in the Opinion.

comment	_118_ comment by: _UK CAA_ **Page No:** 87 **Paragraph No:** Scenario 4 Flight during the night and emergency landing site without any lighting. **Comment:** It is not clear how the estimate of how many airfields have lighting systems available within the risk assessment has been made and does not appear to take into account those airfields that are actually open. **Justification:** In the UK, the number of airfields with lighting that are open 24 hours a day is probably less than 20 and they are generally close to major conurbations. The ability to use an open aerodrome at night for a forced landing must be based upon realistic analysis of what is available, the operational ability to reach it, the skill of the average pilot and the ability of the aerodrome to accept it into its traffic pattern.
response	Not accepted. It is considered that the conservative figure used for this scenario (93 % of the aerodromes possibly selected by CAT SET-IMC operators do not have any lighting at all) is conservative enough. It should be noted that the resulting risk figure mitigated is far from the threshold, and that, therefore, a more conservative figure closer to 100 % would not dramatically change the final result.

comment	_119_ comment by: _UK CAA_ **Page No:** 87 **Paragraph No:** Scenario 4 Flight during the night and emergency landing site without any lighting. **Comment:** The assumptions and expectations made regarding the capability of a landing light to illuminate the touchdown point from 200ft is potentially unrealistic. Most lights are fixed and therefore their effectiveness changes with aircraft altitude. One relevant Flight Manual procedure states that in the engine out landing case, the battery should be switched off when landing is assured, so this would extinguish the landing light. **Justification:** There are no airworthiness requirements relating to the landing light's capability to meet the expectations assumed in the safety analysis nor is there any flight test assessment made in that regard. Any operational expectations for SET-IMC operations must

	be addressed directly by the SET-IMC requirements themselves.
response	Not accepted. Based on test flights performed by PILATUS, it is considered that this 200 ft illumination capability is appropriate for a successful safe forced landing when conducted during the night. In any case, the operator has to demonstrate that the aeroplane meets this requirement, based on data coming from the manufacturer or the STC holder as stated in the draft resulting text.

comment	_120_ comment by: _UK CAA_ **Page No:** 87 **Paragraph No:** Scenario 4 Flight during the night and emergency landing site without any lighting **Comment:** It may not be sufficient to assume that only 50% of flights are operated at night, especially when the RIA suggests that "… SETs will also provide new opportunities for airfreight…", These are commonly night-time operations. The assumptions made in the SET-IMC proposals should be consistent in that context. **Justification:** Many freight operations are principally night time operations, so for these rules to be consistent and sufficiently robust for them, a more realistic probability of night conditions should be adopted.
response	Not accepted. Based on Eurocontrol statistical data, night flights count for 42 % of cargo operations, therefore, less than 50 % of those considered in the SRA (Eurocontrol — Cargo and night flights in European airspace).

comment	_121_ comment by: _UK CAA_ **Page No:** 88 **Paragraph No:** Scenario 5, 'Risk evaluation' column **Comment:** UK CAA believes the answer given is incorrect. **Justification:** $3 \times 10^{-6} * 0.7\% = 0.21 \times 10^{-7}$ **Proposed Text:** The answer should be 0.21×10^{-7}
response	Accepted.

The risk assessment has been accordingly amended and included for information in the Opinion.

comment

130 comment by: *Nigel Johnstone*

Safety Risk Assessments

Scenario 2 - An RVR of 800m equates to met vis of 400m at night and just over

response

Noted.

comment

134 comment by: *Glass Eels Ltd*

Attachments #3 #4

Summary:

Scenario 1:

For the safety risk assessment Scenario 1 Loss of power in icing conditions the author believes that the data with regard to the frequency of encountering icing conditions has been misinterpreted with an outcome of an increased escalation factor. The data has been reworked to produce a new evaluation. The source paper DOT/FAA/AR-05/24 is attached for reference.

Comment:

The Escalation factor of 45% attributed to the referenced paper DOT/FAA/AR-05/24 (see attachment) seems to have been taken out of context. Para 3.1 reads "Figures 4a and 4b show the full-year geographic distribution of icing and Supercooled Large Droplet (SLD) frequencies for most of Europe and some surrounding areas, using a threshold of 0.4. Maximum frequencies were of the order of 45% for icing and 15% for SLD,.. etc". An explanation is given later in the paragraph: "While the frequencies may sound large, recall (section 2.3) that this number was calculated using a low-to-moderate threshold (0.4) and that it indicates that there was a chance of icing or SLD at any altitude, somewhere within 100 km of the sounding site. It does not imply that icing and SLD would be encountered by 30% and 5% of all flights into that area, respectively."
An analysis of the data in FIGURE 8a. TIME-HEIGHT DISTRIBUTION OF INFERRED ICING FREQUENCY (%) FOR ALL EUROPEAN STATIONS COMBINED shows that for a typical operating altitude in the 9,000 ft. to 12,000 ft. range for a C208, the estimated annual risk is of icing is 7% and of supercooled large droplets, 1%.
In addition it is emphasised that an icing / SLD layer is rarely deeper than 2000ft. This and the low probability event that the aircraft does encounter icing, at the best glide speed descent rate for a C208 of approximately 750 ft.minute, the exposure is less than 3 minutes.

An analysis of the flight records for the C208 operated by this company throughout Europe shows 3 incidents of icing sufficient to degrade performance in 5000 flight hours / 3000 sectors giving an observed probability of less than 10^{-3} , a factor of 70 less than that used in the revised Scenario analysis offered in the proposed text: Revised Scenario 1 attached
Conclusion:
The escalation factor given in scenario 1 is over stated and based on DOT/FAA/AR-05/24 should be no greater than 7% for a Europe wide distribution and that icing sufficient to affect performance is of the order of 1%.

response

Accepted.

The risk assessment has been accordingly amended and included for information in the Opinion.

comment

140 comment by: *Daniel HUNN*

Scenario 2 - An RVR of 800m equates to met vis of 400m at night and just over 500m during day (assuming high intensity lights). This cannot be considered ‘equivalent’ to VMC in terms of the likelihood of non-fatal landings. The idea that only 24% of forced landings would be fatal with no natural horizon, difficult distance perception and difficult obstacle avoidance (because the landing site will not be a lit runway) is highly optimistic. It is important to note that at night, the use of a landing light will further reduce forward visibility in reduced meteorological visibility.

response

Accepted.

The rate for unsuccessful forced landing for this specific scenario has been increased to address this concern. It should be noted, nevertheless, that a successful safe forced landing is considered to be any forced landing with no fatalities. It could, therefore, include damages to the aeroplane and injuries to the passengers, hence, it cannot be directly compared with a forced landing on a well illuminated runway.

comment

141 comment by: *Daniel HUNN*

Scenario 3 - An RVR of 550m equates to met vis of 225m at night and just over 370m during day (assuming high intensity lights). These conditions make for challenging landings to well lit runways without an in-flight emergency. This is then coupled to a possible cloud base of 200’ or below. The idea that only 50% of forced landings would be fatal with no natural horizon and near impossible distance perception & obstacle avoidance is highly optimistic. It is important to note that at night, the use of a landing light will further reduce forward visibility

	in reduced meteorological visibility.
response	Accepted. The rate for unsuccessful forced landing for this specific scenario has been increased to address this concern.

comment	*142* comment by: *Daniel HUNN* Scenario 4 - Unlit landing sites. A non-fatal accident rate of only 50% seems highly optimistic. Much is made of availability of well served airfields in Europe. Yet, we are told that this type of operation is most likely in remote areas where the economic case is weak but social needs are high. As such, to assume that 70% of landing sites will be airfields (regardless of the lighting arrangements) assumes that flights will be evenly spread throughout Europe. For the economic and social needs alluded to this seems highly unlikely and overly optimistic.
response	Not accepted. In any case, it is considered that CAT SET-IMC flights can include local flights as well as longer flights to or from a remote area. This is why the assumption that 70 % of the landing sites are airfields, which is a rate based on studies performed by some operators in Europe, is considered realistic. Regarding the 50 % success rate of a safe forced landing, it is considered appropriate since it is based on actual figures which show a general rate of 12 %. Therefore, 50 % is considered conservative enough for this scenario.

comment	*149* comment by: *General Aviation Manufacturers Association / Hennig* GAMA appreciates the thorough safety risk assessment conducted by the agency. This safety risk assessment provides strong and conservative support for the ability to conduct CAT SET-IMC operations and meet the desired level of safety for the operation at the aggregate level. GAMA notes that one safety feature that may be used in some future SET aeroplane designs has not been identified as a further mitigation. This safety feature that may have some limited use is parachute recovery systems which, as an example, would further mitigate the consequences when the loss of power event occurs in areas where there is no landing site available. Similarly, some of the SET aeroplanes are equipped with airbags that will further assist with mitigation.
response	Noted.

comment | *159* comment by: *Glass Eels Ltd*

Comment:

Scenario 2:

It was unclear as to the basis of the 2.28% escalation factor. If it were the yearly occurrences of a RVR below 1,500 m the risk evaluation per flight hours should be factored by the average sector flight time.

Proposed Text:

No new text is proposed as the contribution of the evaluated risk to the overal fatal accident rate is small.

response | Noted.

Some additional explanation on the origin of this number has been provided in the SRA included for information in the Opinion.

comment | *160* comment by: *Glass Eels Ltd*

Scenario 3:

Comment 1:

Summary: Radio altimeter does not contribute to risk reduction.

Scenario 3 is that of "Low visibility at the planned landing site (RVR below 550 m or ceiling below 200ft) (3 %)*".

The JAA NPA OPS 29 Rev 2 Mitigations are:

1. Planning procedure should include the consideration of enroute weather information relevant to the landing sites.
2. Requirement for a radioaltimeter.

With respect to 1: The wisdom of a planning procedure that considers enroute weather is self evidence.

With respect to 2: No rationale is offered as to how a radio altimeter might contribute to the mitigation of this risk nor any numerical analysis as to its contribution to the reduction of the risk of fatalities on emergency landing from 50% to 12%. See earlier comments on the ineffectiveness of historic height data as command instrument to direct the pilot to manoeuvre to avoid terrain and obstacles.

Comment 2:

The note ** states "A conservative figure related to the rate of a successful emergency landing (without fatalities) of 50 % (compared to the 12 % observed by the JAA) was considered for an emergency landing with an RVR below 550 m and a ceiling below 200 ft. on

	a planned landing site". The sense of this statement is thought to be the reverse of the intent: Propose New Text: ** A conservative figure related to the rate of a successful emergency landing (without fatalities) of 50 % (compared to the 12 % fatal rate following a forced landing, observed by the JAA) was considered for an emergency landing with an RVR below 550 m and a ceiling below 200 ft. on a planned landing site. **Comment 3:** It is unclear as to how the analysi deals with the overlap of "a late visual acquistion of the [planned] landing site" and that of an unplanned site / inhospitable terrain though any error should be small.
response	Accepted. The risk assessment has been accordingly amended and included for information in the Opinion.

comment	*161* comment by: *Glass Eels Ltd* **Scenario 4**: Emergency landing without ground lighting. The mitigations seem proportionate and effective.
response	Noted.

comment	*162* comment by: *Glass Eels Ltd* **Scenario 5:** Flight over hostile/congested area within the gliding distance (30 %) Comment *Summary* The 15 minute risk period is unnecessary to meet the safety objective. Discussion See comment no. 133.
response	Partially accepted. The Agency recognises that the risk level could be managed appropriately for flights with risk periods of more than 15 min per flight. It is as well acknowledged that this 15-min limit might lead to operational practices adding additional risks.

	Therefore, the draft resulting text has been amended to provide a possibility to extend the risk period available, based on a risk assessment to be established by the operator for the specific route concerned. The 15-min limitation has been kept in the SRA since it is the baseline mitigation.

comment	*163* comment by: *Glass Eels Ltd* **Scenario 6:** Inexperienced crew in relation with the planning phase **Comment** The migigation is proportionate and effective.
response	Noted.

comment	*164* comment by: *Glass Eels Ltd* **Scenario 7:** Crew without the relevant experience related to the conduct of the emergency landing (20 %). **Comment:** The mitigation is proportionate and effective. The risk evaluation is 10x10-6 x (0,2 x 50 % + 0,8 x 12 %)** = 1,96x10-6. The 0.8 relates to NOT inexperienced pilots which overlaps with all the other scenarios. This results in an over statement of the fatal rate. This has been addressed in the FTA attached.
response	Accepted. The risk assessment has been accordingly amended and included for information in the Opinion.

6. Appendices — 6.10.Appendix I: ICAO Annex 6 cross-reference table p. 120-128

comment	*17* comment by: *VOLDIRECT* *4. Operator certification or validation* *(...)* *In addition to the normal requirements for operator*

	certification or validation, the following items should be *addressed in relation to operations by single-engine turbine-* *powered aeroplanes:* *(...)* *e) planning and operating minima appropriate to the* *operations at night and/or in IMC; SPA.SET-IMC.105 paragraph (d)(2)* *CAT.OP.MPA.110 + AMCs* And this AMC CAT.OP.MPA.110 reads: *c) Required RVR/VIS – aeroplanes* *(1) For multi-engined aeroplanes (...) the take-off minima specified by the operator should be expressed as RVR/CMV (converted meteorological visibility) values not lower than those specifi ed in Table 1.A.* *(2) (...)* *(3) (...)* In order to avoid confusion of applicability, the following text should be added as follows: *SPA.SET-IMC.115 SET IMC Take-off minima* *(The take-off RVR/visibility specified by the operator should be expressed as RVR/CMV (converted meteorological visibility) values not lower than those specified in Table 1.A from* AMC CAT.OP.MPA.110*.*
response	Partially accepted. The Agency acknowledges that there were no specific provisions in NPA 2014-18 related to take-off minima for CAT SET-IMC operations. Taking into consideration the reliability of the engine concerned, the Agency considers that a minimum RVR value of 800 m is appropriate for CAT SET-IMC operations, in comparison to the higher RVR requirement for multi-engined aeroplanes which may need to reland immediately in the event of a critical engine failure during take-off (up to 1500 m depending on the height at which the engine failure occurs). An amendment to AMC1 CAT.OP.MPA.110 to reflect this has been introduced in the draft AMC and GM provided in this CRD.

comment	*18* comment by: *VOLDIRECT* 6. Route limitations over water *6.2 Any additional distance allowed beyond the glide distance* *should not exceed a distance equivalent to 15 minutes at the*

	aeroplane's normal cruise speed. The 15-minutes value should not be a fixed value; see other comments above. The text should be: *6.2 Any additional distance allowed beyond the glide distance* *should not exceed a distance equivalent to 15 minutes (<u>for an aircraft with a reliability figure of 1 failure per 100 000 flight hours, or extended to more than 15 minutes according to the k-factor described in section GM2 SPA.SET-IMC.105(d)(2) SET-IMC operations/ SAFETY RISK ASSESSMENT)</u> at the aeroplane's normal cruise speed.*
response	Partially accepted. The Agency recognises that the risk level could be managed appropriately for flights with risk periods of more than 15 min per flight. It is as well acknowledged that this 15-min limit might lead to operational practices adding additional risks. Therefore, the draft resulting text has been amended to provide a possibility to extend the risk period available, based on a risk assessment to be established by the operator for the specific route concerned.

6. Appendices — 6.11.Appendix J: Crew composition study in relation with the PWC accident database	p. 129

comment	*79* comment by: *Hendell Aviation* **6.11. Appendix J: Crew composition** The statistics should be based on accidents per flight hours, not absolute numbers. Now there is no indication on the amount of operations on each crew combination and, thus, the arguments based on this presentation should be invalidated.
response	Accepted. The Agency agrees with the comment. However, it have not been included in the Opinion.

Attachments to comments

Airports 2.pdf
Attachment #1 to comment #132

G-EELS-ANAL-011_1-1.pdf
Attachment #2 to comment #133

Scenario 1.pdf
Attachment #3 to comment #134

DOT-FAA-AR-05-24.pdf
Attachment #4 to comment #134