European Aviation Safety Agency

Comment-Response Document 2013-09

Reduction of runway excursions

CRD TO NPA 2013-09 — RMT.0570 — 16.4.2015

EXECUTIVE SUMMARY

This Comment-Response Document (CRD) contains the comments received on Notice of Proposed Amendment (NPA) 2013-09 (published on 10 May 2013), that is a summary of the comments and of the responses provided thereto by EASA, as well as all individual comments and responses.

Due to the nature of the comments received on NPA 2013-09, EASA has decided to publish a new NPA on the reduction of runway excursions. The proposal of the new NPA will put more emphasis on safety objectives against the risk of runway excursions, while providing more flexibility in terms of design solutions. The means to achieve these objectives will be provided in a technical standard developed jointly by industry and national aviation authorities with the support of an international standardisation body.

The Terms of Reference for the RMT.0047 (25.027), RMT.0569 and RMT.0570 rulemaking task 'Reduction of Runway Excursions', Issue 1, will be revised accordingly and the associated timeline and process map will be updated.

Any reactions to this CRD should be submitted via the CRT by clicking the 'add a general reaction' button.
The applicable CRD page and paragraph/rule reference should be clearly indicated in all reactions submitted.

Applicability	
Affected regulations and decisions:	Part-26 (expected to be adopted in 2015/Q2); CS-26 (expected to be adopted in 2015/Q2); ED Decision 2003/02/RM, as last amended by ED Decision 2015/008/R 'Certification specifications and acceptable means of compliance for large aeroplanes (CS-25)'
Affected stakeholders:	Large aeroplane TC holders and applicants for TC/STC; large aeroplane operators; flight crew and training organisations
Driver/origin:	Safety
Reference:	N/A

Process map	
Concept Paper:	No
Terms of Reference:	9.10.2012
Rulemaking group:	No
RIA type:	Full
Technical consultation during NPA drafting:	No
Publication date of the NPA:	10.5.2013
Duration of NPA consultation:	3 months
Review group:	No
Focussed consultation:	2.10.2014
Publication date of the Opinion:	N/A
Publication date of the Decision:	N/A

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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 Rulemaking Programme for 2015, under RMT.0570. The scope and timescale of the task were defined in the related Terms of Reference (see process map on the title page).

The draft amendments to Part-26, CS-25 and CS-26 have been developed by the Agency. All interested parties were consulted through NPA 2013-09[3], which was published on 10 May 2013.

171 comments were received from 30 commentators representing industry, national aviation authorities and social partners.

The text of this CRD has been developed by the Agency based on the comments received during the public consultation of NPA 2013-09 and the outcome of the focussed consultation (workshop) which took place on 2 October 2014.

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 the comments and responses as well as the full set of individual comments (and responses thereto) received to NPA 2013-09. No resulting rule text is provided in this CRD.

1.3. The next steps in the procedure

Stakeholders are invited to provide reactions to this CRD regarding possible misunderstandings of the comments received and the responses provided.

Such reactions should be received by the Agency not later than **16 June 2015** and should be submitted using the automated **Comment-Response Tool (CRT)** available at **http://hub.easa.europa.eu/crt**[4].

The Agency will publish a new NPA on reduction of runway excursions. The proposal in the new NPA will emphasise the safety objectives against the risk of runway excursions, while providing more flexibility in terms of design solutions.

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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), as last amended by Commission Regulation (EU) No 6/2013 of 8 January 2013 (OJ L 4, 9.1.2013, p. 34).

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 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://www.easa.europa.eu/document-library/notices-of-proposed-amendments/npa-2013-09

4 In case of technical problems, please contact the CRT webmaster (crt@easa.europa.eu).

The means to achieve these objectives will be provided in a technical standard developed jointly by industry and national aviation authorities with the support of an international standardisation body.

The Terms of Reference for the RMT.0047 (25.027), RMT.0569 and RMT.0570 rulemaking task 'Reduction of Runway Excursions', Issue 1, will be revised accordingly and the associated timeline and process map will be updated.

2. Summary of the comments and responses

171 comments were placed by 30 stakeholders (aircraft and equipment manufacturers, airline and pilot associations, national aviation authorities, etc.). Although all commentators recognised runway excursions as an important safety issue, many of them criticised certain aspects of the proposal.

One comment challenged the safety benefit brought about by on-board systems. The commentator proposed to delay rulemaking until further analyses and studies could demonstrate their safety benefit.

In the European Action Plan for the Prevention of Runway Excursions, several recommendations are made to help reduce the risk of runway excursions. Installation of on-board systems is part of those recommendations — which are acknowledged at high level. The Agency considers that there is no debate about the improvement of safety such systems could bring about, and that rulemaking in this area is not premature. This comment was therefore not accepted.

Others comments were mainly received on the following topics:

Prescriptive rules

The majority of the commentators considered the proposed rule as being too prescriptive and susceptible to prevent competition. They suggested that the proposal should provide more flexibility and not to promote a specific solution.

They advocated that general rules focussing on the safety objectives could be developed by a rulemaking group and complemented by jointly developed technical standards. This would then allow for a level playing field and harmonisation at international level.

Harmonisation with the Federal Aviation Administration (FAA) and International Civil Aviation Organization (ICAO)

Certain comments considered rulemaking premature since there was no equivalent action neither at ICAO nor at FAA level. The commentators complained that it could create an imbalanced situation.

Aircraft population affected and rule implementation timeline

The majority of the commentators considered that certain categories of large aeroplanes are less at risk than others (i.e. turboprop versus turbojet aeroplanes). In general, commentators requested the exclusion from the rule of aeroplanes below a certain seating capacity or mass.

Certain commentators were concerned that the proposed rule affects not only new designs but also new production of aircraft of already certified types. The commentators argued that it could be difficult to modify existing designs.

The timeline for the implementation of the rule was also considered unrealistic and challenged by some commentators.

Costs

The costs estimated in the Regulatory Impact Assessment (RIA) were often considered unrealistic and not taking into consideration some other significant impacts, such as the additional cost of flight crew training.

Alternative means

Few comments highlighted the need to also work on other vehicles to help reducing runway excursions (pilot training, Standard Operating Procedures (SOPs), runway condition reporting, arresting means, etc.).

The NPA and the comments were further discussed with certain stakeholders during a focussed consultation (workshop) organised by the Agency on 2 October 2014.

Said comments have been either accepted, partially accepted, or noted. In particular, the Agency has decided to publish a new NPA on the reduction of runway excursions.

The new NPA will focus more on the safety objectives required for the system (intended function), which will be complemented by a technical standard developed jointly by industry and national aviation authorities with the support of an international standardisation body.

The Agency will also reassess the cost impact of the proposed rule.

In order to develop a RIA with the most realistic figures, stakeholders are once more invited to contribute and provide data on the different costs expected (non-recurring cost, recurring cost for new production and retrofit, training, etc.). The figures to be provided will be treated in confidentiality.

The fleet of aeroplanes affected by the proposed rule and the timeline of the implementation will be duly reconsidered in the new NPA. However, the final outcome will depend on the RIA conclusions and, consequently, on the feedback received from the stakeholders.

3. Draft Certification Specifications (CSs), Acceptable Means of Compliance (AMC) and Guidance Material (GM)

No resulting text is provided in this CRD.

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	*9* comment by: *Dassault Aviation* Summary of DASSAULT-AVIATION comments: DASSAULT-AVIATION supports the NPA CS-25 requirements proposal, but is not in a position to meet CS-26 mandate for in production A/C.
response	*Noted* The Agency acknowledges Dassault Aviation's position on the proposed requirements.

comment	*35* comment by: *THALES AVIONICS*

General	**Page :** all	**Reference :**
General comment : This NPA is requiring through CS 25.705, that ROAAS is a real-time system making energy-based system. As such, this proposed regulation will allow an effective step for significantly reducing runway overrun events during the landing phase. Indeed, real-time assessments of aeroplane energy at landing is the only way to effectively assess potential risk of runway overrun events and to timely and non-routinely alert the crew while alleviating nuisance alerts, - by taking account in real-time : o changing weather conditions during final approach, o different runway friction according to runway contamination as well as inhomogeneous runway friction along the runway, o variable or delayed braking applications, - while providing such protection, typically in a phase with a heavy workload, o in the more transparent way to the crew o together with intuitive procedures to be performed when an alert is raised.		

response | *Noted*

The Agency acknowledges Thales Avionics' support for the proposed requirements.

comment | *36* comment by: *THALES AVIONICS*

General	**Page :** all	**Reference :**

Current NPA text :
ROAAS acronym used all along this NPA
Thales concern :
ROAAS acronym is used in this NPA without defining the meaning of this acronym except in the Executive Summary
Rationale for action :
It is suggested to explain this acronym at least once in the core text of the NPA, e.g. as an additional paragraph of § 2.1 "overview of the issues to be addressed" (page 5).
Action & rewording proposal:
Suggested modification : Insert between first and second paragraph, following new paragraph :
"Among those on-board systems, Runway Overrun Awareness and Avoidance Systems (ROAAS) are particularly efficient for significantly contributing to the reduction of those events."

response | *Accepted*

The Agency will consider the proposed modification during the drafting of the new NPA.

comment | *37* comment by: *THALES AVIONICS*

General	**Page :** all	**Reference :**

Current NPA text :
ROAAS system used all along this NPA
Thales concern :
ROAAS system is used all along this NPA without providing a brief description of its intended functionalities, except through CS 25.705 requirements
Rationale for action :
It is suggested to provide a brief description of intended functionalities for ROAAS in the initial part of this NPA.
Action & rewording proposal:
Suggested modification : Insert an additional paragraph of § 2.1 "overview of the issues to be addressed" before existing second paragraph, following new paragraph :
"ROAAS is a crew alerting system that makes in real-time energy-based assessments of predicted stopping distance versus remaining available landing distance, providing the flight crew with timely non-routine predictive alert both in-flight and on ground during the landing roll in case or predicted runway overrun risk, in order to contribute to the reduction and to protect against runway overrun events."

response *Accepted*

The Agency will consider the proposed modification during the drafting of the new NPA.
A description of the intented functionalities of the Runway Overrun Awareness and Avoidance System (ROAAS) will be provided.

comment *38* comment by: *THALES AVIONICS*

General	**Page :** all	**Reference :**

Thales concern :
ROAAS acronym refers to "Awareness" and "Avoidance". However those terms are not defined in CS-25 Book 2 appendix 5.
Furthermore all along this NPA some other terms are also widely used such as "alerting", "protection" and "prevent", in particular among others, in 26-205 and in CS 25.705 (on page 9) , and in references and recommendations such AS AC91-79 (on page 6) , A11-28 and EAPPRE (on page 7)
"Awareness" and "Avoidance" are used in the system name, in the explanatory note / overview (Page 5 §2.1) and in the terminology (p11 §6) and conversely "alerting" and "protection" are used as a functionality in the draft decision CS 25.705 (page 9 §3.2.2) and in the draft opinion Part 26 26.205 (Page 9 §3.1.1)
Rationale for action :
Though "protection" is also not defined in CS-25 Book 2 appendix 5, it is suggested to rename this system and its acronym accordingly by "Runway Overrun Alerting and Protection Systems (ROAPS)" everywhere in this NPA (as well as in all our other comments) together with providing a definition for the wording "Prevention".
Action & rewording proposal:
It is therefore suggested to replace everywhere in this NPA the wording "awareness" by "alerting" and the wording "avoidance" by "protection"
With following suggested definition for the wording "protection" : "a generic term used to express that the considered system reduce the level of a type of incidents or accidents more than a prescribed minimum of Runway Overrun incidents or accidents"

response *Partially accepted*

The Agency will consider the proposed modification during the drafting of the new NPA.

comment *54* comment by: *Airbus*

Airbus fully supports the intent of this NPA to introduce on board system capable to compute predicting stopping distance based on real time aircraft energy monitoring.

Airbus' experience has shown that this type of system provide a significant safety benefit when installed on aircraft. In the brief time that these systems have been available they have prevented several incidents. In addition, Airbus internal evaluation of several incidents and accidents over the past several years has definitively shown that an ROASS would have prevented several accidents and even when operating outside of its validated domain, a ROAAS system contributes to reducing the speed at which the aircraft exits the runway thus greatly increasing the survivability of the incident/accident.

For full effectiveness, it is essential that the system consider weather conditions (i.e. effect of wind), environmental conditions (runway state and characteristics) , aircraft configurations including effect of deceleration means and aircraft trajectory deviations (i.e. long flare) . It

	should deliver clear and unambiguous cautions or warnings to the crew to initiate immediate preventive actions.
response	*Noted* The Agency acknowledges Airbus' support for this NPA.

comment	*64* comment by: *EUROCONTROL* The EUROCONTROL Agency does not have any particular comments on the amendments proposed under NPA 2013-09 relating to the reduction of runway excursions.
response	*Noted* The Agency thanks EUROCONTROL for having reviewed NPA 2013-09.

comment	*65* comment by: *Luftfahrt-Bundesamt* **LBA comment** In general, the LBA agrees with NPA 2013-09, however, compared to the AMC material for Takeoff Configuration Warning Systems (AMC 25.703), AMC 25.705 does not provide sufficient guidance on ROAAS system criticality. The AMC should be amended to include appropriate guidance on DAL determination, integrity, reliability and availability issues.
response	*Noted* The Agency will consider this comment during the drafting of the new NPA.

comment	*78* comment by: *Boeing* GENERAL COMMENT: Boeing is concerned that this proposed rule is overly prescriptive in that it is proposing to require only one specific solution to address the runway overrun issue. We maintain that it is not in the best interest of current and future aviation to have a single design solution as the framework for the industry to solve an issue this complex. These CS-25 requirements would benefit by being more performance-based -- that is, they should specify outcomes rather than specific solutions, or define the requirements that a system should meet rather than a list of functional requirements. This approach will ensure that manufacturers and integrators have the flexibility to provide the best solution to the overrun excursions issue. It will also ensure that newer runway mitigation innovations and technologies, which may provide more substantial safety gains, are not discouraged or hindered by current rigid regulations. In consideration of this, Boeing strongly recommends that EASA reconsider the course of this current rulemaking project, and convene a rulemaking working group, made up of experts in the aviation industry worldwide, to help develop a practical regulatory solution. As has been proven in many past EASA rulemaking projects, use of such teams ensures that appropriate stakeholders, both technology developers and end users, are able to provide their expertise in developing new rules that are practical, achievable, and harmonized. Such a working

	group could benefit from similar existing efforts, such as the current Runway Excursion Joint Safety Analysis and Implementation Team (RE JSAIT), as well as alignment with the recommendations from the FAA-sponsored Take-off and Landing Performance Assessment Aviation Rulemaking Committee (TALPA-ARC).
response	*Partially accepted* The Agency has decided to publish a new NPA putting more emphasis on safety objectives against the risk of runway excursions. The means to achieve these objectives will be provided in a technical standard developed jointly by industry and national aviation authorities with the support of an international standardisation body. This should provide for more flexibility and harmonisation.

comment	*89* comment by: *AEA* The AEA is concerned that the proposed rule is too prescriptive and seems to have been written to mandate one specific technical solution to prevent runway excursions (i.e. Airbus Runway Overrun Protection System). In this context, we have also taken note of the concerns expressed by the Boeing Company, which the AEA supports. In particular, AEA would strongly recommend that EASA reconsiders its current rulemaking project and convenes a rulemaking group consisting of all major stakeholders with the aim to develop a more practical rulemaking proposal independent from particular technical solutions. The AEA could support a rule for newly designed aircraft (EASA CS-25) provided that any such rule allows for competition between different suppliers. It is therefore also advisable that the Arinc Airlines Electronic Engineering Committee (AEEC) develops an ARINC standard for such equipment before any EASA rule/standard is imposed. Such an Arinc Standard would promote competition between different suppliers but would also create a standard which enables usage on multiple types of aircraft. Any EASA rule/standard should be harmonized with the US FAA and as such form the basis for a global ICAO standard.
response	*Partially accepted* The Agency has decided to publish a new NPA putting more emphasis on safety objectives against the risk of runway excursions. The means to achieve these objectives will be provided in a technical standard developed jointly by industry and national aviation authorities with the support of an international standardisation body. This should provide for more flexibility and harmonisation.

comment	*90* comment by: *AEA* It should be noted that technological means (such as the Airbus ROPS or Honeywell Smart Runway System) are only one possible element to reduce the risks related to runway excursions along other measures. Airlines are reviewing the means best adapted to their operations as part of their individual Safety Management Systems (SMS). Premature rulemaking by EASA should therefore be avoided, in particular in the absence of global

(ICAO) standards or corresponding rules from the US FAA.

An EASA rule for newly delivered aircraft would be premature and would create problems in relation to mixed fleet flying (probably forcing airlines to retrofit their entire fleets in order to avoid negative human factors issues) and should therefore be avoided in particular in the absence of corresponding ICAO standards and US FAA rules.

The AEA would not support a premature EASA retrofit rule, bearing in mind the fact that such systems are still in their infancy and therefore could lead to a questionable return on investment as far as safety and finance are concerned. Mandating a new system, before collecting enough real-life operation data about this new system may bring unexpected results. We want to remind EASA to remember the AOA conic plate applications on Airbus aircrafts, which were installed mandatory to eliminate a problem. The field experience on the aircrafts revealed that they will cause more trouble than the flat plates and the operators are now instructed to remove them mandatory.

However, EASA should facilitate the certification process for installing such systems in order to gain more in service experience. In this context, it is also of utmost important that EASA certification procedures are not biased towards products of certain suppliers.

response *Noted*

In the European Action Plan for the Prevention of Runway Excursions, several recommendations are made to help reduce the risk of runway excursions. The installation of on-board systems is part of those recommendations — which are acknowledged at high level. The Agency considers that there is no debate about the improvement of safety such systems could bring about, and that rulemaking in this area is not premature.

The Agency has decided to publish a new NPA putting more emphasis on safety objectives against the risk of runway excursions.

The means to achieve these objectives will be provided in a technical standard developed jointly by industry and national aviation authorities with the support of an international standardisation body.

This should provide for more flexibility and harmonisation.

comment *91* comment by: *AEA*

Comparing the Airbus ROPS with Honeywell's RAAS: Honeywell RAAS System is an advisory system. It is emphasized in the manuals, that RAAS shall not be used for navigation purposes. If the ROPS becomes a mandate for new delivery Wide Body aircrafts, we don't know if it would be mandatory to obey to its instructions or it would be an advisory system?

Condsidering that all the ROPS instructions will be based on the updated Terain Data Base information: Terrain Database Update periods are not regular and there is not a well developed system to reflect the runway changes to the Manufacturer's TDB. In several cases airlines had to report the wrong warnings to the Manufacturer so that they could update their TDB accordingly. In some cases the updating can not catch the first TDB Update and it is postponed to following TDB Updates. The period between the TDB Updates is not standard and the TDB Updating Procedure can be laborous for the Operators. Considering all of these,

	to result in a Go-around or full braking decision the TDB should be more reliable.
response	*Noted* The Agency will consider this comment during the drafting of the new NPA.

comment	*93* comment by: *AEA* **ROAAS availability** The crew should be informed when the ROAAS is not available. The non-availability of the ROAAS may be due to: (a) An internal failure, which should be indicated to the crew by a specific alert. (b) The failure of a system affecting the ROAAS availability (for example failure of all GNSS receivers). In this case the non-availability of ROAAS should be documented in the AFM and this information should be provided to the crew when the associated abnormal procedure is performed. (c) On-board runway data not available for the landing runway. This information should be available to the crew when the landing runway is selected in the FMS.
response	*Noted* The Agency will consider this comment during the drafting of the new NPA.

comment	*94* comment by: *AEA* **Data availability** The efficient use of such a system requires several conditions: (a) The system is designed according to the certification process, to allow safe operation and to ensure that the system operation will produce safety benefits. (b) There is an efficient data production process to guarantee accuracy and integrity as well as availability of on-board runway data. (c) Crews are properly trained to use the system, in order to be able to react in a timely and adequate manner to alerts generated by the system (cf. next paragraph). Paragraph 8 of AMC 25-705 addresses the accuracy and integrity of the on-board data, but the two other points: data availability and crew training are not addressed and their economic impact is not taken into account in the regulatory impact assessment. Concerning the on-board data, there are several possibilities: (a) ROAAS uses the airport navigation system data base (which is the case for ROW/ROPS on A380). In this case, there is no additional data base costs, the data base is regularly updated according to AIRAC cycles, but this data base covers a limited number of airports (usually the destination airports and a limited number of alternates). (b) ROAAS uses the EGPWS, which is a worldwide data base (used for TAWS TCF function as well as for RAAS), but with less frequent updates. In this case, there is no additional costs but impact of the data update or of missing and/or incorrect data (in case of new runway or runway works) should be considered. (c) ROAAS uses its own data base, and, in this case, the issue of availability and cost (data

	base purchase and distribution costs) must be considered in the Regulatory Impact Assessment.
response	*Noted* The Agency will consider this comment during the drafting of the new NPA.

comment	*103* comment by: *FNAM-French Aviation Industry Federation* FNAM (Fédération Nationale de l'Aviation Marchande) is the French National Professional Union / Trade Association for Air Transport, grouping as full-members: - CSTA: French Airlines Professional Union (incl. Air France), - SNEH: French Helicopters Operators Professional Union, - CSAE: French Handling Operators Professional Union, - GIPAG: French General Aviation Operators Professional Union, - GPMA: French Ground Operations Operators Professional Union, - EBAA France: French Business Airlines Professional Union. And as associated members: - SAMERA: French Airport Material Handling & Catering Professional Union, - UAF: French Airports Professional Union. <u>Introduction</u> The NPA 2013-09 introduces changes in comparison within: - Certification Specifications for large aeroplanes (CS-25) related to Commission Regulation (EC) No1702/2003; - Additional Airworthiness Specifications for Operations (CS-26) related to Commission Regulation (EC) No1702/2003; - Part-26 requirements related to Commission Regulation (EC) No 1702/2003; The comments hereafter SHALL BE considered as an identification of some of the major issues the FNAM asks to EASA to discuss with third-parties before any publication of the proposed regulation. In consequence, the comments hereafter SHALL NOT BE considered: - As a recognition of the third-parties consultation process carried out by the European Parliament and of the Council; - As an acceptance or an acknowledgement of the proposed regulation, as a whole or of any part of it; - As exhaustive: the fact that some articles (or any part of them) are not commented does not mean the FNAM has (or may have) no comments about them, neither the FNAM accepts or acknowledges them All the following comments are thus limited to our understanding of the effectively published proposed regulation, not withstanding their consistency with any other pieces of regulation. <u>FNAM General Comments</u> This NPA refers to the certification standards related to the introduction of new system which will be mandatory to implement in large aeroplanes (multi-turbine engines, more than 5.7 tons except commuters) operated in Commercial Air Transport. The FNAM welcomes this NPA considering that through its implementation, it will imply an increase of the level of safety by reducing the number of runway excursions. Thus, it will

imply a strengthening of the harmonisation and the Level Playing Field within the European States.

This NPA is providing an analysis of impacts on 3 options related to the introduction of ROAAS technology in the European fleet. The best option has to be taken in order not to penalise the European companies operating large aeroplanes.
The point of view of the stakeholders of this NPA is mandatory, as they are more eligible to forecast the real impact of the integration of this new system.

The FNAM is suggesting a certain number of ideas to answer to the proposals of this NPA:
- 1. Allow different system solutions to prevent runway excursion,
- 2. Refine the type of aeroplane affected by this NPA by integrating the aeroplane maximum capacity,
- 3. Harmonise the proposed amendment with the FAA and ICAO standards,
- 4. Insure the crew response effectiveness on this new system.

These axes are detailed below.

1. Allow different system solutions to prevent runway excursion
This proposed rule is mandating only one specific technical solution to prevent runway excursion. The FNAM is suggesting to EASA to develop a more practical rulemaking proposal, independent from particular technical solutions. In order to get the safety benefits rapidly, the technical requirement must be open allowing to cope with any aeroplane architecture. It will allow avionics manufacturers to propose efficient solutions.

2. Refine the type of aeroplane affected by this NPA by integrating the aeroplane maximum capacity
The type of aeroplane affected by this NPA should be refined. It includes all aeroplanes from 5.7 tons (all aeroplane regulated under the CS-25). As a matter of fact, the smaller the aeroplane is, the lower the risk of runway excursion is for the same runways. Thus, the number of fatalities and injuries decrease in terms of aeroplane size. However, the installation cost is basically the same. The regulatory impact assessment (RIA) should take into account the effectiveness relative to aeroplane size/capacity.
The FNAM is recommending to exclude aeroplane with a seating capacity under 60 or a MTOW under 45,500kg. This limit is generally accepted as the limit between “small” and “large” – large transport category aeroplanes.
The FNAM is asking to EASA to implement a RIA on this proposal in order to evaluate the effectiveness of it. According to the result, the mandate may be revised to affect only higher capacity aeroplane.

3. Harmonise the proposed amendment with the FAA and ICAO standards
Today, there is no specific requirement from ICAO and FAA to implement ROAAS. Nevertheless, as explained in the NPA, ICAO is considering the development of international standards and recommended practices for the prevention of runway excursions.
In the absence of corresponding ICAO standards and FAA rules, the FNAM is suggesting to EASA to avoid premature rulemaking at the European level.
Coordination on the development of this new requirement should be implemented between ICAO, FAA and EASA. What is more, this new requirement will require time and will lead to additional costs for European operators compared to the non-European operators.

4. Insure the crew response effectiveness on this new system
To get positive results on the ROAAS system, crew must be properly trained to use it, in order to be able to react in a timely and adequate manner to alerts generated by the system. Specific training for this system must be integrated into the type rating course of each aeroplane which will integer the system, which will require simulator modification.
The FNAM is asking to EASA to give more specifications about this subject since only a global assessment on the economic impact is established on part 4.5.4.2., without any precision.
A RIA should take into consideration the crew training and operational factors associated with the introduction of this new system.

The FNAM, through its following comments, is suggesting also the clarification of certain new articles introduced in the NPA. These general comments are developed and explained article by article, in the further relevant sections of the CRT associated to the NPA 2013-09.

response *Partially accepted*

The Agency will consider those comments during the drafting of the new NPA.

The Agency has decided to publish a new NPA putting more emphasis on safety objectives against the risk of runway excursions.

The means to achieve these objectives will be provided in a technical standard developed jointly by industry and national aviation authorities with the support of an international standardisation body.

The fleet of aeroplanes affected will also be reconsidered.

comment *115* comment by: *UK CAA*

The UK CAA are fully supportive of this NPA. We have two comments which we hope the Agency finds helpful.

response *Noted*

comment *118* comment by: *IATA*

Attachment **#1**

Thank you for giving us the opportunity to comment on this NPA.

IATA is concerned that the proposed regulation is too prescriptive and appears to have been written to mandate one specific technical solution to prevent runway excursions (i.e. Airbus Runway Overrun Protection System). IATA would strongly recommend that EASA reconsiders its current rulemaking project and convenes a rulemaking group consisting of all major stakeholders with the aim to develop a more practical rulemaking proposal independent from any particular technical solutions.
IATA could support a regulation for newly designed aircraft (EASA CS-25) provided that any such rule allows for competition between different suppliers. It is therefore also advisable that an ARINC standard is developed for such equipment before any EASA rule/standard is imposed. Such an ARINC Standard would not only promote competition between different suppliers, but would also create a standard which enables usage on multiple types of aircraft.

	Any EASA rule/standard should be harmonized with the US FAA and as such form the basis for a global ICAO standard. Furthermore, it should be noted that technological means (such as the Airbus ROPS or Honeywell Smart Runway System) are only one possible element to reduce the risks related to runway excursions along other measures. Airlines are continuously reviewing the means best adapted to their operations as part of their individual Safety Management Systems (SMS). Premature rulemaking by EASA should therefore be avoided, in particular in the absence of global (ICAO) standards or corresponding rules from the US FAA. An EASA rule for newly delivered aircraft would be premature and would create problems in relation to mixed fleet flying (possibly forcing airlines to retrofit their entire fleets in order to avoid negative human factors issues) and should therefore be avoided. IATA does not support a premature EASA retrofit rule, bearing in mind the fact that such systems are still in their infancy and therefore could lead to a questionable return on investment as far as safety and finance are concerned. Mandating a new system, before collecting enough real-life operation data about this new system may bring unexpected negative results. An example of this from the past is the EASA mandate to install AOA conic plate applications on Airbus aircrafts; these were mandatory installed to eliminate a problem. The field experience on the aircraft revealed that they would cause more trouble than the flat plates and the operators have now been mandated to remove them. However, EASA should facilitate the certification process for voluntary installation of runway excursions prevention systems in order to gain more in service experience. In this context, it is also of utmost important that EASA certification procedures are not biased towards products of certain suppliers. With reference to the specifications of available technology, it is worth comparing the Airbus ROPS with Honeywell's RAAS: Honeywell RAAS System is an advisory system. As emphasized in the operations manuals, that RAAS shall not be used for navigation purposes. If the ROPS becomes mandated for new delivery Wide Body aircrafts, it is not clear if it would be mandatory to obey to its instructions or it would be an advisory system. Considering that all the ROPS instructions are dependent on up to date Terrain Data Base information, it is worth noting that Data Base update periods are not regular and there is not yet a well-developed system to provide terrain Data Base Providers with information about runway changes. In several cases airlines have reported spurious warnings to the Providers in order to have their Data Base updated accordingly. In some instances, there is a considerable time before the data base is updated with new information. The period between the updates is not standard and the updating procedure can be fairly complex for the Operators. Considering all of the above, it is clear that the Terrain Data Base should become more reliable before any Go-around or full braking decision is based on them.
response	*Partially accepted* The Agency has decided to publish a new NPA putting more emphasis on safety objectives against the risk of runway excursions. The means to achieve these objectives will be provided in a technical standard developed jointly by industry and national aviation authorities with the support of an international standardisation body.

This should provide for more flexibility and harmonisation.

comment

135 comment by: *FAA*

The proposed AMC 25.705 8(a) appears to conflict with CS 25.1309(a) and AMC 25.1309 9(a)(1). The proposed AMC 25.705 8(a) implies that there may be conditions within an airplane's operating and environmental conditions for which the ROAAS does not perform its intended function. CS 25.1309(a) requires equipment and systems, required for type certification or by operating rules, or whose improper functioning would reduce safety, perform as intended under the aeroplane operating and environmental conditions. AMC 25.1309 9(a)(1) states, "The aeroplane operating and environmental conditions over which proper functioning of the equipment, systems, and installation is required to be considered includes the full normal operating envelope of the aeroplane as defined by the Aeroplane Flight Manual together with any modification to that envelope associated with abnormal or emergency procedures. Other external environmental conditions such as atmospheric turbulence, HIRF, lightning, and precipitation, which the aeroplane is reasonably expected to encounter, should also be considered."

response

Noted

The Agency will consider those comments during the drafting of the new NPA.

comment

148 comment by: *Ryanair Technical Services*

Attachment #2

Ryanair has reviewed NPA 2013-09 and has the attcahed comments.

Regards

John Clear
Deputy Director - Technical Services

response

Partially accepted

The new approach taken by the Agency (publication of a new NPA and joint development of a technical standard) is a positive reply to the majority of the comments placed by Ryanair Technical Services.

comment

149 comment by: *Gulfstream Aerospace Corporation*

Attachment #3

See attached comments provided by Gulfstream Aerospace Corporation.

response

Partially accepted

The Agency will consider those comments during the drafting of the new NPA.

The Agency has decided to publish a new NPA putting more emphasis on safety objectives

against the risk of runway excursions.

The means to achieve these objectives will be provided in a technical standard developed jointly by industry and national aviation authorities with the support of an international standardisation body.

The timeline will also be reconsidered.

comment *150* comment by: *Vincenzo PANICO*

Comments to NPA 2013-09:
"Reduction of Runway [longitudinal, overrun] Excursions"
Toulouse 12 Aug 2013
In regard to the NPA 2013-09 concerning runways overrun at landing, ATR would like to submit the following comments.
Summary/ Safety concern
As this NPA and its proposed CS 25.705 concerns only longitudinal excursions, ATR considers Turboprop Regional aircraft not impacted by the subject rule. Indeed, while regional turboprops have sort of STOL landing characteristics in respect to jet aircraft, airport runways used by our operators average a length three times longer than the ATR landing distance. This is comforted by ATR statistics, showing three minor events and one with one fatality over 28 years of operations, with about 26 millions of flights, and some 950 aircraft in service with 180 operators.
Cost/Benefit
In sustain of the non-applicability of this NPA to our product, ATR would like to highlight that while the cost-benefit evaluation made in the subject NPA is surely applicable to jet aircraft, it is unfortunately biased for the smaller/ slower regional turboprops:
Repair Costs
The average repair costs in case of a serious event for ATR is definitively lower of what estimated (the NPA offers some 11 Millions of Euros, while an ATR repair cost following a serious event can be in the 1 Million to 4 Million Euros range).
Option 2) and 3), implementation costs
In the same fashion, we tend to think that the costs of a ROAAS are quite higher of what offered in the NPA:
-Option 2 (production fit by 2017): we don't see any NRC (non recurring cost) exposed: design office costs, meetings, vendor contacts,…, procurement. This can be as low as few 100,000 Euros in case of a simple stand-alone system, to some 10^6 (Million) Euros in case of a system to be interconnected to existing FMS/ NAV systems. For production aircraft NRC and installation costs are unknown at this time, and any case quite impossible to reverse on the aircraft price, as Operators will not be interested in this ROAAS feature for a turboprop aircraft.
-Option 3, Retrofit: cost-wise we don't see exposed the operator's costs of aircraft ground time which could be any part from 1 day to 3 days according to the complexity of the change and to the maintenance status of the aircraft: (i) financial costs of aircraft non-utilization (rent costs, bank mortgage,….) do not seem to be accounted for, unless hidden in the exposed digits (39,000 Euros max per aircraft, the NPA says); (ii) loss of pax revenues don't show up in the NPA either; (iii) mechanics' MH's are not emphasized in the NPA, either. If correct, these costs would add, for ATR aircraft only, a rough estimated value of 50,000 Euros /day/aircraft to the cost of the retrofit kit. ATR has today a flying fleet of 1,000, just to make simple evaluation of total retrofit costs.

-Retrofit: on top of the above financial constraints/adjustments to be (possibly) considered, we should also keep in mind that about one third of ATR fleet has old avionics technology, for which the considered retrofit might be not technically applicable.
Conclusions
These considerations about smaller than NPA estimated hull repair costs and higher than estimated industrial costs, make –from a mere financial standpoint- the installation of ROAAS not attractive.
ATR applauds to this initiative going in the right direction as Safety enhancement. Nevertheless, it considers that regional turboprop should not be involved in this initiative, as the cost for this type of aircraft would be extremely high, while the safety benefits quite non-existent, as ATR history shows.
ATR considers Turboprop Regional aircraft are not impacted by runways overrun at landing due to their landing characteristics in respect to jet aircraft. Implementation of a ROOAS on Turboprop aircraft would bring minimal –if any- benefit versus high burden and costs for both manufacturer and operators.
Option 1 would be still valid, thou, as integral part of new types.

response *Partially accepted*

The Agency will consider those comments during the drafting of the new NPA and the associated RIA.

The fleet of aeroplanes affected will also be reconsidered.

comment *154* comment by: *DGAC France*

The overall objective of installing Runway Overrun Awareness and Avoidance Systems (ROAAS) as proposed in NPA 2013-09 is supported.

Nonetheless, DGAC France wishes to highlight the following points:

1. Applicability
1.1. Few elements are provided by the Agency concerning the feasibility of development ROAAS by every single large aeroplane/equipment manufacturer. In particular are the smallest manufacturers capable of developing efficient tools in a relatively short time frame?

In the context of this NPA, "efficient" means, as mentioned in paragraph 4.5.4.1 (page 20), a "ROAAS [that] can help reduce significantly the number of accidents and fatalities/injuries if installed and performing its intended function" for which "an unjustified increase of Go-Around rate is not expected".

1.2 In the same perspective, whereas DGAC France recognises the value of the cost-benefit analysis concerning the ROAAS implementation as an important element of judgement, this analysis probably lacks accuracy for decision-making : sub-categories among "large aeroplanes" should have been considered to determine the relevance of the ROAAS mandate applicability. In other words, the proportion of accidents/casualties highly varies within the "large aeroplanes"category and this variation may make the ROAAS mandate less relevant for the "smallest" of large aeroplanes.
For instance, worldwide data collected through the « Aviation Safety Network » show that, between September 1991 to February 2012, 95% of the fatalities were killed in accidents for which the maximum take-off mass of the aeroplane was over 45t.

Hence

- equipment of newly type certificated aeroplanes is not argued,
- the incidence of certain criteria (e.g. Maximum Take-Off Mass or MOPSC ...) on accident should determine if newly delivered large aeroplanes of existing types should all really be equipped

1.3. On the contrary, the option consisting in a full ROAAS retrofit, either for all aeroplanes or for some existing aircraft (for which the benefit of ROAAS is the highest) should be reviewed by the Agency in the future, depending on the observed trend of ROAAS costs equipment and into service equipped aeroplanes feedback.

2. As described in paragraph 4.1 (page 13) of this NPA, the causal factor prevailing for landing overruns is wet/contaminated runway (38% in Europe and 66% outside Europe).
In this perspective:

- emphasis should be placed on the information provided to the flight crew, although probably outside the scope of the present NPA;
- certified ROAAS should be compatible with possible and foreseeable evolutions stemming from e.g. ICAO runway friction harmonisation task force as this could have a direct impact on the performance and efficiency of the system.

response

Partially accepted

The Agency will consider those comments during the drafting of the new NPA and the associated RIA.

comment

158 comment by: *Michael Hickey*

Attachment #4

ELFAA has reviewed the NPA and our comments are as per the attached document
kind regards
Michael Hickey
ELFAA representative on the SSCC

response

Partially accepted

The new approach taken by the Agency (publication of a new NPA and joint development of a technical standard) is a positive reply to the majority of the comments placed by ELFAA.

comment

159 comment by: *Aerospace Industries Association*

Aerospace Industries Association (AIA) is concerned that this proposed rule is overly prescriptive in that it proposes to require only one specific solution to address the runway overrun issue. We strongly recommend that EASA reconsider the proposed course of this rulemaking project, and convene a rulemaking working group to develop a more practical regulatory solution. Such a working group could greatly benefit from similar existing efforts, such as the current Runway Excursion Joint Safety Analysis and Implementation Team (RE

	JSAIT).
response	*Partially accepted* The Agency has decided to publish a new NPA putting more emphasis on safety objectives against the risk of runway excursions. The means to achieve these objectives will be provided in a technical standard developed jointly by industry and national aviation authorities with the support of an international standardisation body. This should provide for more flexibility and harmonisation.

comment	*173* comment by: *Rockwell Collins, Inc.* Rockwell Collins strongly endorses the intent of EASA to reduce runway excursions, believing that clear and implementable regulation and guidance will improve aviation safety globally.
response	*Noted* The Agency thanks Rockwell Collins for its support.

comment	*174* comment by: *ACSS* ACSS is very supportive of this safety initiative. ACSS is actively exploring solutions for runway excursion prevention as part of our already extensive portfolio of products related technology. ACSS has conducted preliminary design analysis of safety systems that could fulfill this requirement and found complementary solution to Traffic Collision Avoidance System (TCAS) and Automated Dependant Surveillance-Broadcast (ADS-B) linked to Runway Excursion. We believe that it is feasible to modify existing safety systems to cover this additional functionality. This could be done both for forward fit and retrofit installation via software upgrades coupled with some I/O modifications to TCAS and/or TAWS equipment already mandated on airplanes. In reviewing the Summary of impact and cost-effectiveness assessment (Table 8), ACSS past experience suggest that it would be beneficial to re-evaluate or re-consider Option 3. Due to the large number of additional injury and fatality prevented, the industry might benefit in joining forces (manufacturer, operators and authorities) to generate economical incentives to allow for better Cost effectiveness. ACSS believes that the technology is available today to deliver these types of real-time energy-based solutions on both new programs and existing fleet for a maximum safety benefit
response	*Partially accepted* The Agency thanks ACSS for its support. The Agency welcomes any additional data from ACSS that will allow to reconsider option 3.

comment	*177* comment by: *EBAA* **Reference** Engineered Materials Arresting Systems (EMAS) **Proposal / comment** An NPA on "Reduction of Runway Excursions" should address runway excursions preventive means also at airport infrastructure level and evaluate their interaction with the proactive on-board technology. Recommendation to install EMAS is also missing in the European Action Plan for Prevention of Runway Excursions (EAPPRE) Recommendations as it is not considered a preventive measure. Nevertheless as they significantly reduce damage to aircraft and passengers (the use of which would also be positively reflected in the statistics used in the NPA impact assessment) their use should not only be recommended but probably also mandated. **Justification** The FAA Advisory Circular AC No 150/5220-22A on Engineered Materials Arresting Systems (EMAS) defines the standards for the planning, design, installation and maintenance of EMAS in runway safety areas. A European standardisation of this existing technology would be also advisable.
response	*Noted* The Agency acknowledges that EMAS is also one of the vehicles to help reduce runway excursions. However, EMAS is out of the scope of the current rulemaking task.

comment	*178* comment by: *EBAA* **Reference** European Action Plan for Prevention of Runway Excursions (EAPPRE) Recommendations EAPPRE Recommendation 3.4. to Aircraft Operator 3.4.4 GENERAL The aircraft operator should consider equipping their aircraft fleet with technical solutions to prevent runway excursions. **Proposal / comment** Beside the recommendation 3.5.3 to Aircraft Manufacturer "On-board real time performance monitoring and alerting systems that will assist the flight crew with the land/go-around decision and warn when more deceleration force is needed should be made widely available", Recommendation 3.4.4 to Aircraft Operator should be also addressed in the NPA, being aircraft operators among the affected stakeholders. **Justification** Aircraft Operators are not less affected than Aircraft Manufacturers by the proposed regulation.
response	*Accepted* The proposed requirements in Part-26 are indeed addressed to aircraft operators.

comment	*181* comment by: *AW Analyst* While we understand the desire to promulgate performance based general rules to avoid being overly prescriptive, this rule appears to be written to leave real requirements and compliance to individual representatives of the authority working a given project. All of our current avionics suppliers offer systems that can alert the crew to a runway that is too short (as well as other factors such as the wrong runway, non-stabilized approach, etc.) but looking at their specifications versus this rule, we cannot be sure if their systems would be considered by the authority to meet the rule. **Consider more specific rule/AMC material to drive standardization for acceptable solutions.**
response	*Accepted* The Agency has decided to publish a new NPA putting more emphasis on safety objectives against the risk of runway excursions. The means to achieve these objectives would be provided in a technical standard developed jointly by industry and national aviation authorities with the support of an international standardisation body. This should provide for more flexibility and harmonisation.

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comment	*132* comment by: *FAA* The titles of proposed CS 26.205 and CS 25.705 use the word "avoidance" but in the body of the both rules, the word "protection" is used. If there isn't a difference in meaning or intent of the 2 words we recommend use the same word. Conversely, if there is a difference, we recommend provide explanation thereof.
response	*Partially accepted* The Agency will consider this comment during the drafting of the new NPA.

comment	*175* comment by: *EBAA* **Reference** Applicability Affected regulations and decisions: CS-25, CS-26, Part26 Affected Stakeholders : **Large Aeroplane** TC holders and applicants for TC/STC **Proposal / comment** Due to historical/certification reasons, some CS-23 certified aircraft having a maximum certificated take-off weight of more than 5700 kg (E.g. Embraer Phenom 300 or CESSNA Model 551 Citation II/SP**,** re-certified for single-pilot operations) clearly would fall within the definition of large aeroplane (for which CS-25 - Airworthiness Standards for Large Aeroplanes

– applies) as for the definition of Large Aeroplane. The risk of overrun, which is linked to the actual landing distance required with respect to the landing distance available, is clearly dependant on the landing mass.
As the proposed rulemaking only applies to CS-25 certified aircraft, the advice is to review the applicability, to somehow include those CS-23 certified aircraft featuring equivalent landing masses and performances.

Justification
According to the Annex to ED Decision 2007/016/R "CS-Definitions"
'Large aeroplane' means an aeroplane of more than 5 700 kg (12 500 pounds) maximum certificated take-off weight. The category 'Large Aeroplane' does not include the commuter aeroplane category (For commuter aeroplane category, see CS 23.1 and CS 23.3).
CS-23 Airworthiness Standards for Normal, Utility, Acrobatic and Commuter Aeroplanes currently include aircraft with equivalent landing performances.

response *Partially accepted*

The Agency will consider those comments during the drafting of the new NPA and the associated RIA.

The fleet of aeroplanes affected will also be reconsidered.

2. Explanatory Note - 2.1. Overview of the issues to be addressed p. 5

comment *10* comment by: *Dassault Aviation*

DASSAULT-AVIATION comment on § 2.1

DASSAULT-AVIATION supports the NPA objectives in order to reduce runway excursions. Considering that Business Jets operate on more diverse airfields and runways than airliners, statistical evidence shows this kind of incident is a major concern for these aircraft types (although fortunately, no fatalities have been reported on FALCON A/C over the last 20 years in accidents where ROAAS could have made a difference).
However, the associated RIA is mainly focused on the airliners point of view, and not really on Business A/C. Analysis results (economical, cost, safety impacts...) provided for airliners in this NPA are different for a smaller A/C:
- For similar development cost, the number of pax and number of A/C produced per year for business jets are much lower, so the cost per aircraft and fatality avoided is significantly higher.
- Futhermore, the proposed mandate would only apply on part of our A/C (public transport).

response *Noted*

The Agency thanks Dassault Aviation for its support for this task.
The Agency welcomes data from Dassault Aviation that will better reflect business jets in the RIA.

comment *39* comment by: *THALES AVIONICS*

Applicability	**Page :** P1 & P5	**Reference : General**

Thales concern & Rationale for action :
Though the NPA applicability seems quite straightforward, some uncertainties may remain on its applicability to "new design". We understand that this category is limited to "new design of large aeroplanes to be operated by European commercial air transport operators", and consequently is not mandatory for "new design of not-large aeroplanes" nor "new design of large aeroplanes operated by non-commercial European air transport operators" nor "new design of large aeroplanes operated by non-European commercial air transport operators"
Additionally this NPA shows little discrepancies in the applicability date, using in some place "after a certain date" or "three years after the publication of the rule" or even " on or after three years after the entry into force of this regulation". Typically, in §2.4 the date could be interpreted as referring to the wording "operated" and not to "produced" and in §4.5 wording "delivered" is inappropriate.
Action & rewording proposal:
Assuming that the later wording is the more appropriate, following modifications are suggested :
- In Executive Summary P1 : replace “installation of ROAAS into large aeroplanes produced after a certain date and operated by European commercial air transport operators” by “"installation of ROAAS into all large aeroplanes newly produced (on or after three years after the entry into force of this regulation) and operated by European commercial air transport operators.”
- In §2.1 Page 5 : replace “into new types of large aeroplanes, but also into newly produced large aeroplanes” and “into new designs and all newly produced large aeroplanes to be operated in commercial air transport” by “"into (both new design and also all newly produced) large aeroplanes operated by European commercial air transport operators"
- In §2.2 Page 5 : replace “large aeroplanes (new designs and newly produced) to be operated in commercial air transport” by “"into (both new design and also all newly produced) large aeroplanes operated by European commercial air transport operators"
- In §2.4 Page 8 : replace “newly produced large aeroplanes operated by European commercial air transport operators three years after the publication of the rule” by “"all large aeroplanes newly produced (on or after three years after the entry into force of this regulation) and operated by European commercial air transport operators.”
- In §3.1.1 Page 9 : replace “Operators of large aeroplanes used in commercial air transport shall ensure that: (a) aeroplanes first issued with an individual Certificate of Airworthiness on or after (three years after the entry into force of this regulation)” by “European operators of large aeroplanes used in commercial air transport shall ensure that: (a) aeroplanes first issued with an individual Certificate of Airworthiness on or after (three years after the entry into force of this regulation)”
- In §4.3 page 16 : replace “Option 2 : .. large aeroplanes operated by European commercial air transport operators produced after a certain date” by “"Option 2 : .. large aeroplanes operated by European commercial air transport operators produced (on or after three years after the entry into force of this regulation)"”
- In §4.5 Page 18 : replace “Option 2 : new types and all newly delivered aeroplanes to be operated by European commercial air transport operators” by "Option 2 : .. (both new design and also all newly produced) large aeroplanes operated by European commercial air transport operators

response | *Partially accepted*

The Agency will consider the proposed modification during the drafting of the new NPA.

comment | *48* comment by: *THALES AVIONICS*

Terminology	**Page :** P5 & P11	**Reference :** §2.1 & §3.2.2 Book 2 §6 terminology

Current NPA text :
These systems typically integrate an awareness function, which applies in flight and aims at triggering a timely go-around action, &
'Awareness function' designates the function providing the flight crew with in-flight and on-ground alerting of runway overrun risk;
Thales concern & Rationale for action:
A discrepancy exists on the domain of applicability of the "awareness function". On one side it is just in-flight and on the other hand it is both in-flight and on-ground".
Action & rewording proposal:
It is proposed to modify §2.1 as follows : "These systems typically integrate an awareness function, which applies both in flight and on the ground and is aimed at triggering a timely go-around action when in-flight or increased intensity of deceleration when on-ground".

response | *Partially accepted*

The Agency will consider the proposed modification during the drafting of the new NPA.

comment | *51* comment by: *Dassault Aviation*

DASSAULT-AVIATION comment on § 2.1:

As a rulemaking text, this NPA should concentrate on defining needs, objectives and requirements for the new function and not specify solutions.

response | *Accepted*

The Agency has decided to publish a new NPA putting more emphasis on safety objectives against the risk of runway excursions.

The means to achieve these objectives will be provided in a technical standard developed

jointly by industry and national aviation authorities with the support of an international standardisation body.

This should provide for more flexibility and harmonisation.

comment 52 comment by: *Dassault Aviation*

DASSAULT-AVIATION comment on § 2.1:

There is a need for harmonisation with FAA rule making to prevent commercial unbalance.

response *Noted*

The Agency intends to propose requirements harmonised as far as possible with other major foreign authorities, such as the FAA.

comment 66 comment by: *Honeywell*

Attachments #5 #6

This section does not recognize that systems aimed at preventing landing excursions already exist and our in operational service in the current fleet. The NPA should include and take into account the impact of existing safety systems in the analysis. An example of such a system is Honeywell's SmartRunway/SmartLanding. Other systems are also in operational service.

See the attached Honeywell NPA Response Cover Letter and Analysis of SmartLanding performance.

response *Partially accepted*

The new approach taken by the Agency (publication of a new NPA and joint development of a technical standard) is a positive reply to the majority of the comments placed by Honeywell.

comment 79 comment by: *Boeing*

Page: 5 of 27
Paragraph: *2.1 - Overview of the issues to be addressed*

The proposed text states:

"… These systems typically integrate an awareness function, which applies in flight and aims at triggering a timely go-around action, and an avoidance function, which applies on ground and optimises available deceleration means to stop the aeroplane. [highlighting added]

This NPA proposes certification standards for these systems and their mandatory installation into new designs and all newly produced large aeroplanes to be operated in commercial air transport. …"

Requested Change : Revise the text of the second portion to read as follows:

*"… This NPA proposes certification standards for ~~these~~ systems **that provide performance monitoring and alerting that will assist the flight crew with the land/go-around decision** and their mandatory installation into new designs and all newly produced large aeroplanes to be operated in commercial air transport. …"*

JUSTIFICATION: The review of events and lessons learned, described on page 7 of the NPA, identifies a very beneficial recommendation that the system should assist the flight crew with the land/go-around decision:

"Ref. 3.5.3 (for aircraft manufacturers):
'On-board real-time performance monitoring and alerting systems that will assist the flight crew with the land/go-around decision and warn when more deceleration force is needed should be made widely available.'" [highlighting added]

The proposed rule to mandate an existing system that provides an alert that aims *"at triggering a timely go-around action"* is a very different and much more specific solution than the recommendation suggests. The rule should not require the functionality of existing systems or technologies, but rather more closely align with this referenced recommendation.

response

Partially accepted

The Agency will consider the proposed modification during the drafting of the new NPA.

comment

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

The General Aviation Manufacturers Association (GAMA) appreciates the European Aviation Safety Agency (EASA) taking steps to address runway excursions. GAMA is an international trade association that represents manufacturers of type certified general aviation airplanes and helicopters as well as engines, propellers and avionics.

GAMA recommends that this Notice of Proposed Amendment (NPA 2013-09) be substantially updated as part of the agency's regulatory process to ensure that the appropriate applicability and approach is taken to effectively mitigate runway excursion accidents.

There are several items that warrant specific review and changes by EASA:

- The NPA does not seem to properly consider business jets including in the cost-benefit analysis, safety analysis, and in statements by the agency that some systems have been developed, certified and put into service on large aeroplanes which is not the case for many OEMs that have responded.
- The NPA proposes applicability that is not practical. This includes the proposal for **in-production aeroplanes** being equipped with "...a real-time crew alerting system that makes energy based assessments of predicted stopping distance versus landing distance available" within 3 years of the entry into force of the regulation (which GAMA assumes would be approximately 2017). In our comments, GAMA recommends a review of the scope, the proposed schedule for compliance, and also the prescriptive requirements and capabilities of the systems that are not performance based.
- The prescriptive nature of the NPA is especially concerning since it may prohibit use and benefits from other solutions that already exists or are in development and

solutions that may provide more cost-effective ways by which runway excursions can be mitigated. The agency needs to specifically address issues in the NPA such as some sections of the NPA proposing "awareness" (see, 2.1) while other sections propose a real-time crew "alerting" system including whether the ROAAS provides an advisory function only. Additionally, it is unclear whether EASA intends for the system to consider runway contamination and other runway excursion accident factors.

Finally, EASA was invited to participate in the U.S. Federal Aviation Administration's (FAA) Takeoff and Landing Performance Aviation Rulemaking Committee (TALPA) which was formed to specifically address runway excursion issues in response an accident at Midway airport. The TALPA had participation from the worldwide aviation industry. The recommendations of the TALPA specifically focused on ensuring a stabilized approach and better communicating the impact of speed, touchdown point, and approach path to pilots as the way by which runway excursions can be effectively mitigated. GAMA recommends that EASA clarify the agency's response and follow-on activities to the TALPA in context of NPA 2013-09.

GAMA appreciates the opportunity to comment on this NPA, but due to the numerous differences between the approach that the agency developed independently and the views of industry, GAMA recommends that the agency fully review the comments received and determine whether additional public review may be beneficial, such as the agency hosting a public workshop in support of the development of the agency's Comment Response Document (CRD) or even convene a rulemaking group to ensure the agency receives appropriate feedback from experts from the worldwide aviation industry.

response *Partially accepted*

The new approach taken by the Agency (publication of a new NPA and joint development of a technical standard) is a positive reply to the majority of the comments placed by GAMA.

comment *160* comment by: *Aerospace Industries Association*

AIA recommends that the text of the second portion be revised to read as follows:

"… This NPA proposes certification standards for systems that provide performance monitoring and alerting that will assist the flight crew with the land/go-around decision and their mandatory installation into new designs and all newly produced large aeroplanes to be operated in commercial air transport. …"

The proposed rule to mandate an existing system that provides an alert that aims "at triggering a timely go-around action" is a very different and much more specific solution than the recommendation suggests ("On-board real-time performance monitoring and alerting systems that will assist the flight crew with the land/go-around decision"). The rule should not require the functionality of existing systems or technologies, but should rather more closely align with the recommendation described on Page 7 of the NPA.

response *Partially accepted*

The Agency will consider the proposed modification during the drafting of the new NPA.

2. Explanatory Note - 2.3. Summary of the Regulatory Impact Assessment (RIA) p. 5

comment	*11* comment by: *Dassault Aviation* DASSAULT-AVIATION comment on 2.3. Summary of the Regulatory Impact Assessment (RIA) "*Today, some systems have been developed, certified, and put into service on large aeroplanes to protect against the risk of runway excursion at landing. Such systems are available and can also be installed retroactively on already type-certificated aeroplanes.*" The regulatory assemment is based on a stated assumption of availability of existing systems. This statement can not be accepted as true for Business jets. As of today, there is not any system currently available which could be installed on DASSAULT AVIATION FALCON A/C. Integration of such a system on DASSAULT-AVIATION A/C will impact Avionics and other A/C systems. Technical and economical relevance (definition, implementation and certification) remain to be demonstrated for already in production A/C. The development effort for application of this system may be found impractical on in-production Business jets, although efforts will be made to ease an early implementation.
response	*Noted* The Agency welcomes data from Dassault Aviation that will better reflect business jets in the RIA.

comment	*12* comment by: *Dassault Aviation* DASSAULT-AVIATION comment on § 2.3 Summary of the Regulatory Impact Assessment (RIA) *"To this end, three options were evaluated in the RIA (see section 4.) requiring the installation of ROAAS:* *(1) on new types only,* *(2) on new types and all new deliveries, or* *(3) on new types, all new deliveries, and all in-service aeroplanes.* *The Agency proposes Option 2 as this would be the most cost-effective way to introduce ROAAS in the European fleet and decrease runway excursions*." DASSAULT-AVIATION agrees on implementation for new types but can not commit on implementation for the new deliveries within the NPA proposed timeframe. As indicated in comment # 11, development and certification activities remain to be performed as there is not any system currently available which could be installed on DASSAULT AVIATION FALCON A/C. The cost of introdution of ROAAS will be similar on airliners and business jets, but as the number of pax and number of A/C produced per year for business jets are much lower, the cost per aircraft and fatality avoided is significantly higher. Therefore, the cost effectiveness analysis of this RIA is questioned for the Business Jet segment.
response	*Noted* The Agency will consider those comments during the drafting of the new NPA.

comment	*67* comment by: *Honeywell* This section, and the NPA in general, does not seem to provide credit to proactive safety-minded operators that have already equipped with systems such as Honeywell's SmartRunway/SmartLanding. The drawback is that this NPA could potentially foster a mind-set of "why proactively equip with safety systems when a mandate will disqualify all of what has been done voluntarily." Operators need more encouragement of voluntary safety improvements given the large investments that have already been incurred. The ROAAS system requirements need to be more generic in nature (as per other NPAs/NPRMs in the past) and are inappropriately over-prescriptive such that operators taking proactive safety measures in the past are now ultimately disqualified. See Section 3.1 comments for further information regarding ROAAS requirements.
response	*Partially accepted* The Agency has decided to publish a new NPA putting more emphasis on safety objectives against the risk of runway excursions. The means to achieve these objectives will be provided in a technical standard developed jointly by industry and national aviation authorities with the support of an international standardisation body. This should provide for more flexibility and harmonisation.

2. Explanatory Note - 2.4. Overview of the proposed amendments p. 5-8

comment	*68* comment by: *Honeywell* The last several paragraphs on page 6 of the NPA do not make a compelling safety case – specifically the paragraph stating "*Experience shows that training and procedures need to be supplemented by on-board means to help the flight crew know during short, final and landing roll, if their real-time landing/stopping distance and trajectory are compatible with the available/remaining runway distance and conditions (i.e. dry or wet runway)*." It is not clear what "experience" is being referred to. In addition it is later stated "*As demonstrated in numerous investigation reports, rapidly changing conditions are key contributors to overrun events*….." It is not clear what "*rapidly changing conditions"* refers to. The top of page 7 presents the NTSB's recommendation - "*Actively pursue with aircraft and avionics manufacturers the development of technology to reduce or prevent runway excursions and, once it becomes available, require that the technology be installed*." The United States NTSB's recommendation defines a flight deck function and leaves the implementation details to the industry to deal with. The NPA language enters into the domain of defining detailed implementations details and restricts alternative implementations that would fully meet the intent of the NTSB recommendation.
response	*Noted* The Agency will consider those comments during the drafting of the new NPA.

comment	*88* comment by: *Bombardier Aerospace* Certain systems currently available contribute to meeting the NPA objective by reducing the potential for runway excursions (e.g. Honeywell smart landing/smart runway™ or Rockwell-Collins Takeoff and Landing Awareness Function). These systems are available now or likely to be available sooner and be cheaper to integrate and install than the proposed ROAAS. However they do not perform real-time crew alerting systems that make energy-based assessments of predicted stopping distance versus landing distance available. Do the safety benefits of energy-based systems justify the exclusion of currently available systems using a different alerting scheme?
response	*Partially accepted* The Agency has decided to publish a new NPA putting more emphasis on safety objectives against the risk of runway excursions. The means to achieve these objectives will be provided in a technical standard developed jointly by industry and national aviation authorities with the support of an international standardisation body. This should provide for more flexibility and harmonisation.

comment	*141* comment by: *ACSS* The proposed rule would only apply to Large Aeroplanes used in Commercial Air Transport. The report "A Study of Runway Excursions from a European Perspective" referenced in the NPA shows that the runway excursion accident rate for business flights is at least as high as the rate for commercial flights. [Reference *Figure 2: Runway excursion accident rate trend for commercial and business flights (incidents excluded)* from NLR-CR-2010-259 "A Study of Runway Excursions from a European Perspective".] A runway excursion accident involving a business aircraft could close a runway and have the same impact to flight cancelations, diversions and delays as a runway excursion accident involving a commercial air transport. **Suggested Change:** In order to realize the safety benefit of a ROAAS on a broader aircraft fleet and to help reduce the probability that a business aircraft runway excursion accident would close a runway and disrupt commercial air travel, the mandate to install a ROAAS should be extended to cover business aircraft as well as commercial air transport.
response	*Noted* The fleet of aeroplanes affected will be reconsidered during the drafting of the new NPA. The Agency welcomes any additional data from ACSS to substantiate the need to include business jets to the aeroplane population affected.

comment	*146* comment by: *General Aviation Manufacturers Association / Hennig* GAMA appreciates the agency identifying US Federal Aviation Administration (FAA) AC 91-79

"Runway Overrun Prevention" as containing lessons learned about how to prevent runway excursions. The AC was developed jointly between the FAA and industry based on detailed analysis of runway excursions that occurred in general aviation, specifically those that occurred in business jets.

The root-cause analysis of runway excursion accidents determined that the typical accident scenario involves an aeroplanes that is fast, comes in high, and lands late and provides guidance to pilots about how to properly make preparations, including ensuring stabilized approaches, that will ensure a safe landing.

While GAMA recognizes that NPA 2013-09 is technology focused, GAMA recommends that EASA review the AC and determine if the development of guidance similar to AC 91-79 would effectively enhance safety and reduce the risk of runway excursions (especially for those pilots for whom the agency's NPA will not mandate equipage).

response *Noted*

Technology is one of the vehicles to help reduce the risk of runway excursions, but not the only one.
Guidance and Standard Operating Procedures (SOPs) are certainly part of the package to reduce this safety risk.
The present RMT focusses on technology; however, the Agency is willing to review data available, such as AC 91-79, to address the issue.

comment *147* comment by: *General Aviation Manufacturers Association / Hennig*

GAMA appreciates EASA identifying the Take-off and Landing Performance Assessment Aviation Rulemaking Committee (TALPA-ARC) as part of currently regulatory activities. EASA was a member of this U.S. FAA chartered ARC and its membership also composed manufacturers from across the world, including Europe, and a cross-section of operators.

The TALPA-ARC's recommendations focus on the importance of stabilized approaches and proper crew training and also includes the results of a comprehensive review of how performance data is developed for transport category aeroplanes. However, the ARC did not recommend the requirement of a ROAAS-like system.

The U.S. FAA has indicated that it will conduct rulemaking in response to the TALPA-ARC's recommendations over the next few years. GAMA recommends that EASA identify any action that the agency plans to take in response to the TALPA-ARC, which was identified as a coordinated rulemaking project. GAMA also recommends that EASA as part of the Regulatory Impact Analysis (RIA) of this NPA review and determine if there is any overlap between NPA 2013-09 with respect to the risk reduction for runway excursions and benefits from the TALPA ARC which include changes to crew training and updated aeroplane performance data.

response *Accepted*

The Agency will establish a more clear link with the TALPA-ARC recommendations in the new NPA.

comment *162* comment by: *Rockwell Collins, Inc.*

	In order to better understand ROAAS requirements and means of compliance, we request that the CRIs mentioned in this section be included in the NPA. If the CRIs are proprietary, we request that a summary of the CRIs - excluding the proprietary information- be included to support better understanding of the intended meaning.
response	*Noted* The Agency will consider this comment during the drafting of the new NPA.

3. Proposed amendments p. 9

comment	*6* comment by: *CAA-NL* We support the proposed amendments to both CS 25 and Part/CS 26, however we have some detailed questions and comments on the RIA. These are given at the related paragraphs.
response	*Noted* The Agency thanks CAA-NL for its support.

comment	*97* comment by: *ERA* ERA: NPA must be coordinated with FAA, both with respect of CS-25/FAR-25 (certification standards) and mandate date. Failing to do so will lead to inconsistent certification standards as most OEM are US, additional cost and problems when moving aircraft between FA/EASA jurisdictions.
response	*Noted* The Agency intends to propose rules harmonised as far as possible with other major foreign authorities, such as the FAA.

3.1. Draft Regulation (Draft EASA Opinion) - 3.1.1 Draft Opinion Part-26 p. 9

comment	*13* comment by: *Dassault Aviation* DASSAULT-AVIATION comment on § 3.1.1 Draft opinion Part-26: In order to take into account the current situation (see comment # 11- 12), DASSAULT AVIATION proposes to limit applicability of this requirement to the case of A/C with more than 20 pax. DASSAULT-AVIATION does not clearly understand what "energy based" means. This should be re-phrased in order to precise the objective / need and not provide the technical solution.
response	*Partially accepted* The Agency will consider those comments during the drafting of the new NPA.

The Agency has decided to publish a new NPA putting more emphasis on safety objectives against the risk of runway excursions.

The means to achieve these objectives will be provided in a technical standard developed jointly by industry and national aviation authorities with the support of an international standardisation body.

The fleet of aeroplanes affected will also be reconsidered.

comment *40* comment by: *THALES AVIONICS*

Applicability	**Page :** P9	**Reference : 3.1.1 Draft Opinion Part-26**

Current NPA text :
Operators of large aeroplanes used in commercial air transport shall ensure that: (a) aeroplanes first issued with an individual Certificate of Airworthiness on or after (three years after the entry into force of this regulation)
Thales concern & Rationale for action :
A clarification is needed to confirm that the first issuance of this individual Certificate of Airworthiness only apply to newly produced aeroplanes, whatever the Airworthiness Agency in the world which has granted the individual Certificate of Airworthiness, and not only by EASA in the case of foreign aircraft already produced before the date of the first issuance by EASA of the individual Certificate of Airworthiness for this aeroplane, in which case we assume it would be a "retrofit situation"
Action & rewording proposal:
Suggested modification of existing paragraph : "Operators of large aeroplanes used in commercial air transport shall ensure that: (a) aeroplanes first issued with an individual Certificate of Airworthiness (by any Airworthiness Authorities) on or after (three years after the entry into force of this regulation)."

response *Partially accepted*

The Agency will consider the proposed modification during the drafting of the new NPA.

comment *55* comment by: *Airbus*

Paragraph 26.205(a) should be modified as follows:

(a) large aeroplanes first issued with an individual Certificate of Airworthiness on or after (three years after the entry into force of this regulation) ~~is~~ are equipped with a ~~real-time~~ crew alerting system that makes real-time energy based assessments of predicted stopping distance versus ~~landing distance available~~ remaining runway length. The system shall provide the flight crew with:
(1) timely in-flight predictive ~~alert~~ caution and/or warning of runway overrun risk, and

(2) on ground predictive ~~alert~~ warning or automated deceleration means for runway overrun protection during landing.

Justification:

It is the calculation of the runway overrun risk alert that should be in real-time as opposed to the alerts which are by definition, in real-time.

The system should continuously assess predicted stopping distance versus remaining runway length for current aircraft position and speed.

In accordance with 25.1322 and with respect to the critical nature of the situation, in-flight alerts should be considered as caution or warning as they require immediate crew awareness and subsequent or immediate flight crew response.

In accordance with 25.1322 and with respect to the critical nature of the situation, on-ground alerts should be considered as **warning** alerts as they require immediate crew awareness and immediate flight crew response. "Automated means" should be more precise, Airbus understand that it is related to "automated deceleration means".

response

Partially accepted

The Agency will consider the proposed modification during the drafting of the new NPA.

comment

56 comment by: *Airbus*

A new paragraph (b) should be added to 26.205, in order to require ROAAS installation into all in-service aircraft:

(b) On and after (eight years after the entry into force of this regulation), all large aeroplanes are equipped with a crew alerting system that makes real-time energy based assessments of predicted stopping distance versus remaining runway length. The system shall provide the flight crew with:

(1) timely in-flight predictive caution and/or warning of runway overrun risk, and

(2) on ground predictive warning or automated deceleration means for runway overrun protection during landing.

Justification:

Airbus supports RIA Option 3 for the following reasons:

Option 3 presents a nearly 75% increase in the number of accidents and fatalities prevented by the installation of ROAAS. EASA estimates a further prevention of 12 accidents and 8 fatalities with Option 3 as compared to Option 2.

Airbus recalls that between 25 and 30% of all accidents are runway overruns. Advances in safety have reduced the accident rate to all-time lows, however the rate of runway excursions has not decreased and in fact the overall number of excursions is increasing due to the increased traffic. (Source IATA Safety Reports)

An ROAAS system has the potential to significantly reduce the number of runway excursions and thus contribute greatly to the aviation safety.

Airbus experience has shown that this type of system can be installed both as a line-fit and a retro-fit solution. The associated costs are very similar to the introduction of the TAWS/EGPWS system for which the final FAA rule was published in 2000 and was applicable to all commercial air traffic. The gain in safety of ROAAS can also be similarly compared with the installation of TAWS/EGPWS.

response

Noted

The Agency will consider this proposal during the drafting of the new NPA.

The Agency welcomes any additional data from Airbus that will allow to reconsider option 3.

comment

69 comment by: *Honeywell*

The wording of the proposed regulation CS 26.205 is too prescriptive and, inappropriately defines detailed implementation of this capability. Paragraph (a) (including sub-paragraphs (1) and (2)) should be replaced with the following:

"*Aeroplanes first issued with an individual Certificate of Airworthiness on or after (three years after the entry into force of this regulation) are equipped with a runway excursion prevention system."*

Note this is fully aligned with the U.S. NTSB recommendation and previous mandates for flight safety systems.

response

Accepted

The Agency has decided to publish a new NPA putting more emphasis on safety objectives against the risk of runway excursions.

The means to achieve these objectives will be provided in a technical standard developed jointly by industry and national aviation authorities with the support of an international standardisation body.

This should provide for more flexibility and harmonisation.

comment

80 comment by: *Boeing*

Page:9 of 27
Paragraph: *3.1.1 - Draft Opinion Part-26*

The proposed text states:

"3.1.1 Draft Opinion Part-26
26.205 Runway Overrun Awareness and Avoidance System (ROAAS)
Operators of large aeroplanes used in commercial air transport shall ensure that:
(a) aeroplanes first issued with an individual Certificate of Airworthiness on or after (three years after the entry into force of this regulation) is equipped with a real-time crew alerting

system that makes energy based assessments of predicted stopping distance versus landing distance available. The system shall provide the flight crew with:
(1) timely in-flight predictive alert of runway overrun risk, and
(2) on ground predictive alert or automated means for runway overrun protection during landing."

Requested Change: Revise this text as follows:

*"**3.1.1 Draft Opinion Part-26***

26.205 Runway Overrun Awareness and Avoidance System (ROAAS)
Operators of large aeroplanes used in commercial air transport shall ensure that:
*(a) aeroplanes first issued with an individual Certificate of Airworthiness on or after (~~three~~ **five** years after the entry into force of this regulation) is equipped with a ~~real-time~~ crew ~~alerting~~ **awareness** system ~~that makes energy based assessments of predicted stopping distance versus landing distance available.~~ The system shall provide the flight crew with:*
*(1) timely in-flight ~~predictive~~ alert **or indication** of runway overrun risk, and*
*(2) on ground ~~predictive~~ alert or ~~automated~~ **indication of an overrun risk or** means for runway overrun protection during landing."*

JUSTIFICATION: The proposed 3-year timeframe for the implementation of the NPA requirements is wholly inadequate, as it does not account for the time necessary for:

- development,
- certification,
- production changes, and
- orderly implementation across multiple models of aircraft.

Further, the nature of any dynamic indications or alerting during a critical phase of flight may require significant aircrew training and perhaps require a device or simulator to complete. After discussions with several large operators, we understand the most cost effective way for a large operator to complete this large scale training is during a pilot's recurring annual training. Because of the time required to train a large crew force, the timeline for the implementation of any rule change should allow for at least 1 year of crew training after the required technology is made available in operator simulators. This additional one-year training period must be accounted for in the NPA timeline.

If applicants are to implement the proposed NPA successfully, we maintain that they will need at least **5** years to accomplish it.

The term *"energy based assessments,"* as used in paragraph 3.1.1(a), is ambiguous. An in-flight prediction of airplane trajectory during the landing and flare phase is challenging because of the dynamic nature.

The term "*landing distance available,"* as used in paragraph 3.1.1(a), seems inconsistent with the idea of a real-time energy-based alert. We consider that the term *"runway remaining"* more accurately captures the intent of the alerts and indications.

Paragraph 3.1.1(a)(2) is unclear as to what part of this system needs to be automated. Does this imply there are no inputs required for the awareness system, or that the deceleration

	devices are triggered automatically, or something else? Clarification is needed to understand this element.
response	*Partially accepted* The Agency will consider the proposed modification during the drafting of the new NPA.

comment	*104* comment by: *FNAM-French Aviation Industry Federation* The type of aeroplane affected by this NPA should be refined. It includes all aeroplanes from 5.7 tons (all aeroplane regulated under the CS-25). As a matter of fact, the smaller the aeroplane is, the lower the risk of runway excursion is for the same runways. Thus, the number of fatalities and injuries decrease in terms of aeroplane size. However, the installation cost is basically the same. The regulatory impact assessment (RIA) should take into account the effectiveness relative to aeroplane size/capacity. The FNAM is recommending to exclude aeroplane with a seating capacity under 60 or a MTOW under 45,500kg. This limit is generally accepted as the limit between "small" and "large" – large transport category aeroplanes. The FNAM is asking to EASA to implement a RIA on this proposal in order to evaluate the effectiveness of it. According to the result, the mandate may be revised to affect only higher capacity aeroplane.
response	*Partially accepted* The fleet of aeroplanes affected will be reconsidered during the drafting of the new NPA. The Agency welcomes any additional data from FNAM that will contribute to better identification of the fleet of aeroplanes affected.

comment	*105* comment by: *Bombardier Aerospace* Bombardier suggests that there should be industry wide standards, via (E)TSO or a more detailed AMC, on the conditions under which the ROAAS should alert and the basic alerting algorithm and required inputs and whether these should be sensed or pilot entered. The availability of such standards will facilitate timely certification. Bombardier suggests that the ultimate calendar date at which newly produced aircraft must be equipped takes into account the time required for developing comprehensive advisory material, as well as the time required for OEMs and equipment manufacturers to certify aircraft with this functionality.
response	*Accepted* The Agency has decided to publish a new NPA putting more emphasis on safety objectives against the risk of runway excursions. The means to achieve these objectives will be provided in a technical standard developed jointly by industry and national aviation authorities with the support of an international standardisation body. This should provide for more flexibility and harmonisation.

comment	*106* comment by: *Embraer - Indústria Brasileira de Aeronáutica - S.A.*

Comment:
Three years after the entry into force of the ROAAS regulation is too short a time.

Reason for comment:
Past experience with CPDLC implementation and certification; and current experience with ADS-B Out has shown that a minimum of a seven year time period is required to allow proper system development and implementation. Anything short of it may require significant unscheduled maintenance costs to European operators to take airplanes out of service to perform the required modification.

Proposed Text:

The text passage:

"Operators of large aeroplanes used in commercial air transport shall ensure that:

ae (a) aeroplanes first issued with an individual Certificate of Airworthiness on or after (three years after the entry into force of this regulation) (…)"

should be changed to:

"Operators of large aeroplanes used in commercial air transport shall ensure that:
(a) aeroplanes first issued with an individual Certificate of Airworthiness on or after (seven years after the entry into force of this regulation) (…)"

response

Partially accepted

The Agency will consider the proposed modification during the drafting of the new NPA.

comment

107 comment by: *Embraer - Indústria Brasileira de Aeronáutica - S.A.*

Comment:
ROAAS should be a real-time crew awareness system rather than a real-time alerting crew system.

Reason for comment:
Embraer understands that an alert system, as in accordance with EASA AMC 25.1322, is a system that attracts the attention of the flight crew, informing them of specific non-normal airplane system conditions or certain non-normal operational events that require their awareness, and, advising them of possible actions to address these conditions; while in an awareness system there is the perception of the state of the aircraft and its relationship to the world, granting the ability to project changes that may occur as the flight progresses, not necessarily advising the flight crew of possible actions. While an alert system is an awareness system, not every awareness system is an alert system. It is Embraer's understanding that conditions that require an alert depend on the specific system and airplane design, and on overall flight-deck philosophy. Thus, depending on the specific ROAAS design, the particular aircraft and its flight-deck philosophy, an alert system may not be necessary, but just an indication, to increase the flight crew awareness, allowing the flight crew the discretion to take the necessary actions.

Proposed text:

The text passage:

"(…) is equipped with a real-time alerting crew system (…)."

should be changed to:

"(…) is equipped with a real-time flight crew awareness system (…)"

response

Partially accepted

The Agency will consider the proposed modification during the drafting of the new NPA.

comment

108 comment by: *Embraer - Indústria Brasileira de Aeronáutica - S.A.*

Comment:
The regulation should point out the desired functionality and not the means by which the functionality is achieved.

Reason for comment:
EASA should only specify the necessary functionality and not the implementation itself. There are a plethora of runway overrun awareness systems that have already been developed and certified by the industry that increase the flight crew situational awareness and these have not been necessarily designed to make energy based assessments. By choosing a certain implementation, EASA is not recognizing due credit to other ways of implementing this functionality that have already been certified and approved, including by EASA.

Also, EASA has not presented a study within this NPA that compares the different implementations and the situational awareness that they provide to the flight crew. Therefore, an energy based assessment, *prima facie*, should not be required.

Finally, from the market's point of view, EASA is restricting the industry and free market competition, by choosing a certain way of implementation.

Proposed text:

The text passage:

"(…) that makes energy based assessments of predicted stopping distance versus landing distance available."

should be changed to:

"(…) that makes assessments (e.g.: by energy monitoring, performance monitoring, database extrapolation/comparison etc) of aircraft characteristics and dynamics versus landing distance available."

response

Partially accepted

The Agency will consider the proposed modification during the drafting of the new NPA.

comment	*109* comment by: *Embraer - Indústria Brasileira de Aeronáutica - S.A.* **Comment:** ROAAS should be a real-time crew awareness system rather than a real-time alerting crew system. **Reason for comment:** The same reasons specified in comment No. 107 apply for this item. Also, an "automated means for runway overrun protection during landing" should not be a requirement, since this might, depending the on the flight deck philosophy, incongruously restrict the flight crew autonomy. It is Embraer's understanding that the functionality "to avoid a runway overrun" could be accomplished merely by a situational awareness system, given the flight history of other runway avoidance systems that have been certified in the past and are currently operating, some for almost a decade. **Proposed text:** The text passage: "(…) (1) timely in-flight predictive alert of runway overrun risk, and (2) on ground predictive alert or "automated means for runway overrun protection during landing." should be changed to: "(…) timely in-flight and on-ground awareness of runway overrun risk."
response	*Partially accepted* The Agency will consider the proposed modification during the drafting of the new NPA.

comment	*121* comment by: *IATA* We thus propose to change the wordings of the last part of CS 25.705 as follows (and to modify draft opinion Part 26-205 accordingly: *(2) The system must provide the crew with on-ground predictive alert of runway overrun risk, which may be associated with an automated means of protection during the roll-out.*
response	*Partially accepted* The Agency will consider the proposed modification during the drafting of the new NPA.

comment	*136* comment by: *Bombardier Aerospace* Editorial note: Why is there a 26.205(a) if there is no 26.205(b)?
response	*Noted*

comment	*143* comment by: *General Aviation Manufacturers Association / Hennig*

EASA proposes through Option 2 an applicability to new type and all new deliveries (NPA on page 5) within 3 years of the entry into force of the regulation. GAMA recommends that EASA review this proposed three-year applicability for both new types and new deliveries and establish an applicability timeframe more suitable to the typical time it takes to develop and install new equipment on aeroplanes (NPA on page 9 for Part 26.205).

As the agency knows, the typical timeframe from making application for new type certification to the granting of a type certificate is five years. The agency, however, through this rulemaking seems to propose that an aeroplane manufacturer that has already locked in final design (such as, through the setting of a certification basis for the project) will have to make changes to their design mid-stream. This will have a negative impact on existing project currently undergoing type certification or validation with the agency. GAMA recommends that for new type, the agency establish a minimum of a five-years in consideration of typical timelines for type certification for new type aeroplanes in the transport category.

Similarly, it is GAMA's experience that the proposed 3-year timeframe for the implementation of the NPA requirements is inadequate for in-production aeroplanes based on the time needed for the development, certification, changes to production, and management by each manufacturer of numerous production lines.

As the agency knows, there have been several recent equipage mandates where the regulated implementation timeframe was insufficient to effectively make changes to new and in-production aeroplanes, including Link 2000 (CPDLC), ADS-B and ACAS.

GAMA recommends that EASA establish a longer timeline for in-production aeroplanes that more cost-effectively consider the needed time to implement ROAAS and also, as discussed in comment 142, consider an appropriate and more narrow applicability for in-production aeroplanes.

response *Accepted*

The fleet of aeroplanes affected and the timeline of the implementation will be reconsidered during the drafting of the new NPA.

comment *144* comment by: *General Aviation Manufacturers Association / Hennig*

EASA proposes to require a Runway Overrun Awareness and Avoidance System (ROAAS) that mitigates the risk of runway excursions on takeoff and landing in 26.205. The agency points to a requirement for a (1) "in-flight predictive alert [...]" and (2) "on ground predictive alert or automated means for runway overrun protection during landing."

It is GAMA's view that the agency's alternating use of the term "awareness" and "alert" creates confusion as to the capability and functionality of the proposed ROAAS equipment. The agency evolving the ROAAS from an awareness to an alert system may disqualify some of the existing systems runway excursion mitigation systems that currently are installed or in development. Additionally, a system that provides awareness can do so in a pre-emptive manner as opposed to an alert function that would only occur when a problem has arisen and as such an awareness system may be superior to an alerting system in mitigating runway excursions. Crew awareness can come in the form of aural indications, callouts, tones, displays, alerts, and other flight deck indications. An alert is only one type of indication.

GAMA is especially concerned about the prescriptive nature of the NPA which likely will narrow the use of several cost-effective solutions that are on the market or in development in favor of a single design that may not be the best mechanism for addressing runway excursions. GAMA members have identified at least two existing runway excursion systems (that is, Honeywell smart landing / smart runway TM and Rockwell Collins Takeoff and Landing Awareness Function) which may not fully meet the prescriptive nature of the NPA. Has the agency reviewed the capabilities of these two existing systems and whether they would effectively mitigate runway excursion? Also, would these systems meet the ROAAS's system definition?

Furthermore, if the agency does not provide credit for existing systems, it must recognize the negative impact of safety culture from the perspective of operators electing to voluntarily equip with safety enhancing systems. These operators have a proactive safety-minded approach and should receive appropriate encouragement from the agency and not have their existing systems disqualified through rulemaking.

GAMA recommends that the agency shift away from this prescriptive approach to a performance based or more generic set of requirements for any equipment that the agency proposes to be required on transport category aeroplanes that conduct scheduled commercial air transport operations. The agency should also consider the use of a public forum, such as existing standards bodies (such as, EURCAE / RTCA) or an agency workshop, to further explore the types of equipment and appropriate standards that may be invoked through a regulation.

response *Partially accepted*

The new approach taken by the Agency (publication of a new NPA and joint development of a technical standard) is a positive reply to the majority of the comments placed by GAMA.

comment *152* comment by: *General Aviation Manufacturers Association / Hennig*

The agency defines the ROAAS as being an "energy based" assessment of the predicted stopping distance versus landing distance available. The term energy based is not clear to GAMA and the agency must either provide clearer guidance as to what is meant by the term (and how it relates to preventing runway excursions) or remove it from the Part-26 requirements to avoid being overly prescriptive and disqualify cost effective runway excursion systems already on the market or in development (per comment number 144).

GAMA is familiar with analysis that identifies the aeroplane's speed, height and touchdown point as key drivers. Energy, however, is primarily driven by speed in context of these three parameters while touch down point ("long landing" in Table 1 at 24 percent of causal factors), high ("too high on approach" at 3.3 percent of causal factors) do not impact energy. Similarly, runway contamination (38 percent), late / incorrect use of breaks (14 percent), late / incorrect use of reverse thrust (14 percent), aquaplaning (7.4 percent) are also unrelated to energy. By using the term "energy based" does the agency infer that the ROAAS not consider these factors? If that is not the intent, GAMA recommends that the agency remove the term "energy based" from Part-26 to avoid inappropriately disqualifying safety technology that may effectively address runway excursions.

response *Partially accepted*

The Agency will consider this comment during the drafting of the new NPA. When used, the term 'energy-based' will be defined.

comment

155 comment by: *DGAC France*

- Scope of part 26.205 : see DGAC general comment (paragraph 1.2 in comment #154) concerning the eligibility criteria for ROAAS mandate (with regard to new deliveries of aeroplanes of existing types).

- In paragraph (a) of part 26.205, the requirement is to have a "alerting system that makes energy based assessments of predicted stopping distance versus landing distance available". The words "landing distance available" should be replaced "remaining runway length"

response

Noted

The Agency will consider this comment during the drafting of the new NPA.

comment

161 comment by: *Aerospace Industries Association*

AIA recommends that the text of this paragraph be revised to read as follows:

26.205 Runway Overrun Awareness and Avoidance System (ROAAS)
Operators of large aeroplanes used in commercial air transport shall ensure that:
(a) aeroplanes first issued with an individual Certificate of Airworthiness on or after (**five** years after the entry into force of this regulation) is equipped with a crew awareness system. The system shall provide the flight crew with:
(1) timely in-flight alert or indication of runway overrun risk, and
(2) on ground alert or indication of an overrun risk or means for runway overrun protection during landing.

The proposed 3-year timeframe for the implementation of the NPA requirements is wholly inadequate, as it does not account for the time necessary for development, certification, production changes, and orderly implementation across multiple models of aircraft. Further, this change would require significant aircrew training and perhaps require a device or simulator to complete. If applicants are to implement the proposed NPA successfully, AIA maintains that they will need at least 5 years to accomplish it.

The term "energy based assessments," as used in paragraph 3.1.1(a), is ambiguous. An in-flight prediction of airplane trajectory during the landing and flare phase is challenging because of the dynamic nature.

The term "landing distance available," as used in paragraph 3.1.1(a), seems inconsistent with the idea of a real-time energy-based alert. We consider that the term "runway remaining" more accurately captures the intent of the alerts and indications.

Paragraph 3.1.1(a)(2) as drafted is unclear as to what part of this system needs to be automated. Clarification of this section is needed to better understand this element.

response

Partially accepted

The Agency will consider those comments during the drafting of the new NPA.

comment	*163* comment by: *Rockwell Collins, Inc.* The NPA does not address short landings. We recommend consideration of including landing short awareness and alerting in this NPA.
response	*Noted* The Agency will consider this comment during the drafting of the new NPA.

3.2. Draft Certification Specifications (Draft EASA Decision) - 3.2.1 Draft Decision CS-26 p. 9

comment *57* comment by: *Airbus*

CS 26.205 should be rewritten as follows:

CS 26.205 Runway Overrun Awareness and Avoidance System (ROAAS)

Compliance with Part 26.205 is demonstrated by complying with CS 25.705, or equivalent, or with the following:

The ROASS is a crew alerting system that makes real-time energy based assessments of predicted stopping distance versus remaining runway length, and meets the following requirements:

(a) The system provides the crew with timely in-flight predictive caution and/or warning of runway overrun risk;

(b) The system provides timely:
(1) on-ground predictive warning, or
(2) automated deceleration means for runway overrun protection during landing;

(c) System protection is demonstrated with the following assumptions:
(1) all standardized runway states as approved in the AFM for ROAAS validity,
(2) realistic runway friction degradation,
(3) effect of the accuracy of input data on system performance,
(4) all braking modes as approved in the AFM for ROAAS validity;

(d) The AFM shall contain:
(1) limiting conditions and availability of the ROAAS,
(2) procedures essential to safe operation.

(e) The awareness and the avoidance functions are shown to be coherent.

(f) The AFM must state that approach must not be initiated to a runway which is shorter than ROAAS alert landing distance for the foreseen approach speed, weight, altitude, temperature and wind conditions at landing. Adequate data or procedures should be published in the AFM to allow application of this limitation. In order to address exceptional cases where operational or environmental constraints make it necessary, a deactivation mean of ROAAS should be provided to the crew, as a mean to avoid inappropriate alerts.

Justification:

Compared to the CS-25 requirements as modified in accordance with our comments on CS 25.705, which are intended for future type certificates, the minimum system requirements for production and in-service aircraft (CS-26) should be adjusted in order to contain line-fit and retrofit complexity and related costs within acceptable limits. Consequently, it is suggested to explicitly define a specific set of minimum standards for CS 26.205.

Experience within Airbus has shown that a system which meets the above minimum standards can be installed on previous generation aircraft.

Further explanation of these standards (c), (d), (e) and (f) are provided in Airbus comment # 58 on the respective paragraphs in CS 25.705.

Paragraph (g) on situational awareness display, which Airbus proposes in CS 25.705, should not be mirrored in CS-26: for already certified aircraft, the safety benefit expected from this situational awareness aid would not be commensurate with the likely cockpit recertification costs and constraints.

response *Partially accepted*

The Agency will consider the proposed modification during the drafting of the new NPA.

3.2. Draft Certification Specifications (Draft EASA Decision) - 3.2.2 Draft Decision CS-25 p. 9-11

comment *1* comment by: *DGA EV*

change is proposed for paragraph 9)a)

quote
9- Production process, accuracy and integrity of used on-board aircraft performance models and runway data
9)a) "To ensure that ROAAS…demonstrated that on board aircraft performance models and runway data used by ROAAS are produced and
updated with acceptable standards and processes, resulting ….and not mislead the flight crew"
unquote

justification:

The system should be energy based but will embed performance models
that needs to be validated in order to ensure that performance computation of LD are not misleading for the creww

response *Partially accepted*

The Agency will consider the proposed modification during the drafting of the new NPA.

comment *2* comment by: *DGA EV*

	the following paragraph should be added quote 9)b) The compatibility between ROAAS alerts and the landing performances used for dispatch and the landing performances used in case of failure in flight should be ensured. unquote justification: It should be proven that the tuning of alerts provided by ROAAS is compatible of the published data used for dispatch and for in flight assessment. No warning should occur when legal to land, and if legal landing distances are seen as too short, legal landing distances should be modified in relevance with ROAAS computations.
response	*Partially accepted* The Agency will consider the proposed modification during the drafting of the new NPA.

comment	*14* comment by: *Dassault Aviation* DASSAULT-AVIATION comment on 3.2.2 Draft Decision CS-25 *"CS 25.705 Runway Overrun Awareness and Avoidance System (ROAAS) (See AMC 25.705) A ROAAS must be installed. The ROASS must be a real-time crew alerting system that makes energy based assessments of predicted stopping distance versus landing distance available, and meets the following requirements:"* DASSAULT-AVIATION does not clearly understand what "energy based" means. This should be re-phrased in order to precise the objective / need and not provide the technical solution. For instance, the airborne phase does not necessarily require the same type of real time computation as the ground phase.
response	*Partially accepted* The Agency will consider this comment during the drafting of the new NPA. When used, the term 'energy-based' will be defined.

comment	*15* comment by: *Dassault Aviation* DASSAULT-AVIATION comment on § 3.2.2 Draft Decision CS-25 The nature and scope of the validation demonstration should be precised.
response	*Partially accepted* The Agency will consider this comment during the drafting of the new NPA.

comment	*16* comment by: *Dassault Aviation* DASSAULT-AVIATION comment on 3.2.2 Draft Decision CS-25 / 4. Definition of terms: Definition of "energy based" should be precised in this section.

response | *Partially accepted*

The Agency will consider this comment during the drafting of the new NPA. When used, the term 'energy-based' will be defined.

comment | *17* comment by: *Dassault Aviation*

DASSAULT-AVIATION comment on 3.2.2 Draft Decision CS-25 / 6. Terminology and acronyms:

'*Avoidance function' designates the function providing the flight crew with on-ground guidance or automated means for runway overrun avoidance during landing.*

Guidance term should be defined.

DASSAULT-AVIATION has understood that an Avoidance function is not mandatory according to the requirements provided with §3.1.1 and §3.2.2 (use of "or" in these sections).

response | *Partially accepted*

The Agency will consider this comment during the drafting of the new NPA.

comment | *18* comment by: *Dassault Aviation*

DASSAULT-AVIATION comment on 3.2.2 Draft Decision CS-25 / 9. Production process, accuracy and integrity of used on-board runway data

"To ensure that ROAAS is properly working on the actual landing runway, it should be demonstrated that on-board runway data used by ROAAS are produced and updated in accordance with acceptable processes, resulting in adequate level of accuracy and integrity to allow real-time performance calculation and not mislead the flight crew."

Adequate level / Adequate processes should be precised.
Charts / Nav DB DAL and integrity used for ROAAS will also need to be confimed. It is expected that safety analysis will determine these levels.

At this point, DASSAULT-AVIATION does not anticipate that such function could be more than advisory and linked to more than major hazard events.

response | *Partially accepted*

The Agency will consider this comment during the drafting of the new NPA.

comment | *41* comment by: *THALES AVIONICS*

Requirements	**Page :** P9 & P11	**Reference : §3.2.2 CS 25.705 & AMC 25.705 §5**

Thales concern & Rationale for action :
CS 25.705 as well as AMC25.705 provide for requirements for overall functionality, human factors, AFM content and Database aspects requirements, but does not provide for Minimum acceptable performance for the ROAAS functionality in particular in terms of probability of timely alerting of potential runway overrun risks, and of acceptable nuisance alert rate. Without a minimum set of minimum acceptable performance data, foreseen new regulation will not guarantee a same level of compliance to regulatory requirements between different solutions from different suppliers or between different installations nor compliance to regulatory requirements at least equivalent to minimum regulatory performances.
Action & rewording proposal:
Therefore it is proposed, that EASA defines within the upcoming new regulation, the minimum set of minimum acceptable requirements (e.g. as MPS – Minimum Performance Specifications – linked to this proposed regulation) appropriately distributed between CS 25.705 and AMC 25.705, so that they would be no needs (or very limited needs) afterwards to set up specific additional requirements during the certification process.
Just given as an example, such Minimum Acceptable Requirements could be as follows :
- Rate of avoided Runway Overrun situations > e.g. 80% (considering that today this value is 0% when no ROAAS are installed) [This success rate may impact the RIA]
- Rate of unnecessary alerting while in approach (in situations with no overrun) : nuisance alert rate when in approach < e.g. 10^{-5} landings
- Rate of unnecessary alerting while on the runway (in situations with no overrun) : nuisance alert rate during landing < e.g. 10^{-tbd} landings
- Minimum height at which and alert implying a go-around maneuver to be performed should be triggered : e.g. as per the AFM
- Maximum crew reaction time < e.g.; 3 seconds
- Maximum Wind conditions : e.g. as per the AFM
- etc …..

response *Partially accepted*

The new approach taken by the Agency (publication of a new NPA and joint development of a technical standard) is a positive reply to the majority of the comments placed by Thales Avionics.

comment *42* comment by: *THALES AVIONICS*

Requirements	**Page :** P11	**Reference : §3.2.2 CS 25.705 & AMC 25.705 §5**

Current NPA text :
The intent of this AMC is to address generic certification issues related to ROAAS. Various systems may satisfy the requirements of providing protection against runway excursion. Therefore, the specific design features of each system will be addressed during the certification process
Thales concern :
As proposed, Acceptable Means of Compliance will be addressed on a case by case basis tuned to address the specific design features of each different system. This will drive for the development of dedicated CRI for each installation, which will not be "public".
Rationale for action :
Therefore, issuance of individual "non-public" CRI will not ensure a harmonized level of compliance to regulatory requirements between different solutions from different suppliers or between different installations.
New regulation should alleviate the need to develop dedicated CRI for each installation. CS/AMC should be self-sufficient. If not, this would open the door for different level of acceptance, and will not ensure for equivalent level of consideration between different suppliers.
Action & rewording proposal:
Therefore it is proposed, that EASA defines within the upcoming new regulation, the minimum set of minimum acceptable requirements, so that they would be no need afterwards to set up specific additional requirements during the certification process, with appropriate balance of those minimum acceptable requirements between CS 25.705 and AMC 25.705

response *Partially accepted*

The new approach taken by the Agency (publication of a new NPA and joint development of a standard) is a positive reply to the majority of the comments placed by Thales Avionics.

comment *43* comment by: *THALES AVIONICS*

Requirements	**Page :** P9	**Reference : §3.2.2 AMC25.705**

Current NPA text :
The ROASS must be a real-time crew alerting system that makes energy based assessments of predicted stopping distance versus landing distance available, and meets the following requirements
Thales concern & Rationale for action:
ROAAS as proposed in this NPA is to make energy-based assessments. However definition (or the domain of acceptable interpretations) of "energy-based" is not provided.
Action & rewording proposal:
Therefore it is proposed, that EASA provides for a definition and associated minimum acceptable requirements for the "energy-based" terminology .

response *Partially accepted*

The Agency will consider this comment during the drafting of the new NPA. When used, the term 'energy-based' will be defined.
If needed, the associated minimum acceptable requirements for 'energy-based' systems will appear in the AMC and/or standards to be developed.

comment *44* comment by: *THALES AVIONICS*

Requirements	**Page :** P9	**Reference : §3.2.2 AMC25.705**
Current NPA text : The ROASS must be a real-time crew alerting system that makes energy based assessments of predicted stopping distance versus landing distance available, and meets the following requirements **Thales concern & Rationale for action:** ROAAS as proposed in this NPA is to perform real-time assessments. However even if this definition seems straightforward no definition for "real-time" or more precise "timing requirements" are provided. **Action & rewording proposal:** Therefore it is proposed, that EASA provides for a definition and associated minimum acceptable requirements for the "real-time" terminology. Therefore it is suggested to mention that "real-time" means that "alert computation must be at least done at (e.g.) 1 Hz" or that "issuance of generated alert must not be delayed due to computation periodicity by more than (e.g.) 1 second ".		

response *Partially accepted*

The Agency will consider this comment during the drafting of the new NPA. When used, the term 'real-time' will be defined.
If needed, the associated minimum acceptable requirements for 'real-time' systems will appear in the AMC and/or standards to be developed.

comment *46* comment by: *THALES AVIONICS*

Requirements	**Page :** P11	**Reference :** §3.2.2 Book 2 AMC25.705 §7

Current NPA text :
Human Factors considerations It should be demonstrated that ROAAS Human Machine Interfaces comply with CS 25.1302. Special attention should be paid to the following criteria
Thales concern & Rationale for action:
This is considered as being redundant with previous paragraph (§2 of §3.2.2 Book 2 AMC25.705) defining related certification specifications. Those related certification specifications should be sufficient by themselves without requiring the need for a specific paragraph on "Human factors considerations".
Action & rewording proposal:
Therefore, it is proposed to delete §7 of §3.2.2 Book 2 AMC25.705.

response *Noted*

The Agency will consider this comment during the drafting of the new NPA.

comment *47* comment by: *THALES AVIONICS*

Requirements	**Page :** P9	**Reference :** §3.2.2 AMC25.705

Current NPA text :
The ROASS must be a real-time crew alerting system that makes energy based assessments of predicted stopping distance versus landing distance available, and meets the following requirements
Action & rewording proposal:
Typo : change "ROASS" by "ROAAS" (or by ROAPS as suggested in a previous comment)

response *Accepted*

The Agency will consider this comment during the drafting of the new NPA.

comment *49* comment by: *THALES AVIONICS*

Terminology	**Page :** P11	**Reference :** §3.2.2 Book 2 §6 terminology

Current NPA text :
'Avoidance function' designates the function providing the flight crew with on-ground guidance or automated means for runway overrun avoidance during landing
Thales concern & Rationale for action:
The terminology definition presents some discrepancy with regard to "on-ground guidance" vs the requirements of the Draft Opinion 26.205 (Page 9 §3.1.1) as well as the draft Decision CS 25.705 requiring only "predictive alerting" when not in an automatic mode
Action & rewording proposal:
It is proposed to modify terminology in §6 as follows : "'Avoidance function' designates the function providing the flight crew when on-ground with predictive alerting or automated means for runway overrun avoidance during landing. "

response *Partially accepted*

The Agency will consider this comment during the drafting of the new NPA.

comment *50* comment by: *THALES AVIONICS*

Requirements	**Page :** P9, P11	**Reference :** §3.1.1 26.205 (a) (2) & §3.2.2 Book 1 CS25.705 (b) (2) & Book 2§6 Terminology

Current NPA text :
(2) on ground predictive alert or automated means for runway overrun protection during landing
Thales concern & Rationale for action:
The requirement for "automated means" needs to be précised.
Action & rewording proposal:
It is proposed to provide following precision to this requirement "automated deceleration means"

response *Noted*

The Agency will consider this comment during the drafting of the new NPA.

comment *53* comment by: *Dassault Aviation*

DASSAULT-AVIATION comment on 3.2.2 Draft Decision CS-25 / 9. Production process, accuracy and integrity of used on-board runway data

"To ensure that ROAAS is properly working on the actual landing runway, it should be demonstrated that on-board runway data used by ROAAS are produced and updated in accordance with acceptable processes, resulting in adequate level of accuracy and integrity to allow real-time performance calculation and not mislead the flight crew."

DASSAULT-AVIATION proposes to rephrase the sentence as follow: "to allow real-time landing / stopping distance calculation and not mislead the flight crew."

response

Partially accepted

The Agency will consider the proposed modification during the drafting of the new NPA.

comment

58 comment by: *Airbus*

CS 25.705 should be changed as follows:

CS 25.705 Runway Overrun Awareness and Avoidance System (ROAAS)
(See AMC 25.705)

A ROAAS must be installed.

The ROASS must be a ~~real-time~~ crew alerting system that makes real-time energy based assessments of predicted stopping distance versus ~~landing distance available~~ remaining runway length, and meets the following requirements:

(a) The system must provide the crew with timely in-flight predictive ~~alert~~ cautions and/or warnings of runway overrun risk; ~~and~~

(b) The system must provide the crew with:
(1) on-ground predictive ~~alert~~ warnings, or
(2) automated deceleration means for runway overrun protection during landing.

(c) System protection must be demonstrated with the following assumptions:
(1) all standardized runway states as approved in the AFM for ROAAS validity,
(2) realistic runway friction degradation,
(3) effect of the accuracy of input data on system performance,
(4) all braking modes as approved in the AFM for ROAAS validity.

(d) The AFM shall contain:
(1) limiting conditions and availability of the ROAAS,
(2) procedures essential to safe operation.

(e) It must be shown that awareness and the avoidance function are coherent.

(f) The AFM must state that approach must not be initiated to a runway which is shorter than ROAAS alert landing distance for the foreseen approach speed, weight, altitude, temperature and wind conditions at landing. Adequate data or procedures should be published in the AFM to allow application of this limitation. In order to address exceptional cases where

operational or environmental constraints make it necessary, a deactivation means of ROAAS must be provided to the crew, as a means to avoid inappropriate alerts.

(g) The aeroplane must include an ROAAS situational awareness display.

Justification:

For the introduction text and paragraphs (a) and (b), please refer to Airbus comment # 55 on Part-26.

Paragraphs (c) to (g) are added because the regulations should provide the minimal acceptable performance standards for this type of system. Without a set of minimum acceptable performance standards, the foreseen new regulation will not guarantee a same level of compliance to regulatory requirements between different solutions from different suppliers or between different installations, nor a compliance to regulatory requirements at least equivalent to minimum regulatory performances.

Paragraphs (c)(1) and (2) are further detailed in our proposed text for AMC 25.705 - 11 - Runway State Friction (see Airbus comment # 63).

Paragraph (d) is consistent with AMC 25.705 - 8 - Aeroplane Flight Manual (AFM Content).

Paragraph (e) is introduced to ensure that consistency is shown between the in-flight and the on-ground alerts. This is further detailed in our proposed text for AMC 25.705 - 12 (see Airbus comment # 63).

Paragraph (f) is introduced for the following reason:
Previous certification exercises have shown that the rate of unduly warnings/cautions must be reduced to a minimum so as to ensure crew confidence in the system. As such, it is essential that the crew not find themselves in a situation where they must willingly ignore unduly alerts.
To reduce the risk of unduly cautions/warning of ROAAS, a means should be provided to the crew to determine the in-flight awareness landing distance.

Paragraph (g) is introduced for the following reason:
Future certificated aircraft should contain a display for situational awareness of the ROAAS system. This is an aid to the pilot to improve situational awareness and visualize when landing margins are small.

response

Partially accepted

The Agency will consider the proposed modification during the drafting of the new NPA.

comment

59 comment by: *Airbus*

In AMC 25.705 paragraph 3 on related material, the TALPA ARC recommendations should be added to the list.

Justification:

These TALPA ARC recommendations are the best reference for realistic performance

	assessment of stopping distances, and are a consensus resulting from comprehensive industry and authorities efforts.
response	*Accepted* Reference to TALPA-ARC recommandations will be added to the list of the related material.

comment	*60* comment by: *Airbus* AMC 25.705 paragraphs 4.c and 4.d should be modified as follows: c. 'Predictive ~~alert~~ caution or warning' means that the ~~alert~~ caution or warning is provided before a problem arises ~~and not during the landing roll~~, with appropriate consideration of the aeroplane configuration, the runway characteristics and the prevailing environmental conditions (e.g. dry or wet runway). d. 'Timely' means that the ~~alert~~ caution or warning is provided at a time at which corrective action (e.g go-around) is still possible. Justification: In comments # 55 through 58, Airbus suggests that the terms "caution" or "warning" be used instead of "alert". The AMC has to be consistent with this terminology. The term "predicitive" is used in 25.705 (a) and (b)(1), and thus is applicable for both in-flight and on-ground alerts.
response	*Partially accepted* The Agency will consider the proposed modification during the drafting of the new NPA.

comment	*61* comment by: *Airbus* In AMC 25.705, a new paragraph e should be added to section 4 - Definition of terms: e. 'ROAAS Validity domain' defines the limit of the domain where it is demonstrated that ROAAS adequately protects against runway overrun through timely warning or cautions. Justification: For clarification.
response	*Partially accepted* The Agency will consider this proposal during the drafting of the new NPA.

comment	*62* comment by: *Airbus* AMC 25.705 section 9 should be modified as follows: **9. Production process, accuracy and integrity of used on-board runway data**

To ensure that ROAAS is properly working on the actual landing runway, it should be demonstrated that on-board aircraft performance models and runway data used by ROAAS are produced and updated in accordance with acceptable processes, resulting in adequate level of accuracy and integrity to allow real-time performance calculation and not mislead the flight crew.

Justification:

The ROAAS system must compute in real-time the stopping distance of the aircraft (based on aircraft performance) versus the remaining runway length. It is necessary to ensure the quality of the onboard performance model used as well as the runway data.

response

Partially accepted

The Agency will consider this proposal during the drafting of the new NPA.

comment

63 comment by: *Airbus*

Two new paragraphs should be added to AMC 25.705:

10. Runway State Friction

The level of friction used for the standardized runway states protected by the ROAAS should be agreed with the Agency. A realistic degradation of friction should be considered as at least 10%.

11. Awareness and Avoidance Coherence

It must be shown that the awareness and avoidance predictive alerts are coherent. An acceptable demonstration would be to show that if no awareness alerts have been triggered, the avoidance function alerts are timely triggered for runway overrun avoidance. The demonstration should be performed considering operational pilot technique and realistic time sequence for deceleration devices not automatically actuated but used in accordance with AFM procedures.

Justification:

These new paragraphs are proposed in relation with the Airbus proposals for new paragraphs (c) and (e), respectively, in CS 25.705 (see Airbus comment # 58).

response

Partially accepted

The Agency will consider this proposal during the drafting of the new NPA.

comment

70 comment by: *Honeywell*

As stated in Section 3.1.1,it is Honeywell's view the proposed text is too prescriptive as it contains implementation details – the regulation should state the intended purpose of the function and allow industry to define the implementation details. Honeywell proposes the text for the proposed CS 25.705 (paragraphs (a) and (b), including sub-paragraphs) be

replaced with he following: "*The ROAAS must be a real-time runway excursion protection system.*"

It is customary for system implementation details to normally be defined in an industry agreed upon Minimum Operational Performance Standards (MOPS). At this point no MOPS for a ROAAS type system could be identified. EASA should point to the necessary MOPS, and if none exists charter a group via EUROCAE/RTCA to define such standards.

Note that provision of accurate real-time runway braking friction data is a pre-requisite for accurate system performance, yet this may be a challenge (especially for contaminated runway surfaces). This point is not acknowledged in the entire document and needs to be fully considered by the NPA. Other unmentioned challenges also include the fact that braking action is not reported in a standardized manner globally. These are the types of issues that could be handled by an industry agreed upon MOPS that has yet to be developed.

Section 6 Terminology and Acronyms: Just as for Section 3.1.1 and 3.2.2, these definitions provide implementation details – more generic terms are required. In addition, the terms "awareness" and "alerting" are normally two distinct flight deck functions. For the "Awareness" function definition provided, the term "alerting" is used in a manner that is not consistent with classical systems design such as TAWS, ACAS - the "awareness function" is normally provided by a graphical display, whereas the "alerting" function is provided by both aural and visual cues. In his manner, the alerting function supplements the awarness function and this is consistent with AMC 25.1322.

Section 7 Human Factors Considerations: This section should reference both AMC 25.1322 and AMC 25-11. This section also needs to include provisions for flight crew training and operational procedures.

Section 9 Production Process, Accuracy and Integrity of Used On-board Runway Data: The dates of applicability for the new rule proposed by the NPA may not reflect the effort that it takes to develop an accurate runway database for ROAAS. Honeywell's extensive expertise in this area suggests that the industry may need more time to develop accurate worldwide runway databases to support a ROAAS function.

response

Partially accepted

The new approach taken by the Agency (publication of a new NPA and joint development of a technical standard) is a positive reply to the majority of the comments placed by Honeywell.

The timeline of the implementation will be also reconsidered.

comment *81* comment by: *Boeing*

Page:9 of 27
Paragraph*: 3.2.2 - Draft Decision CS-25*

The proposed text states:
"3.2.2. Draft Decision CS-25
…
CS 25.705 Runway Overrun Awareness and Avoidance System (ROAAS) (See AMC 25.705)

…
The ROASS must be a real-time crew alerting system that makes energy based assessments of predicted stopping distance versus landing distance available, and meets the following requirements:
(a) The system must provide the crew with timely in-flight predictive alert of runway overrun risk; and
(b) The system must provide the crew with:
(1) on-ground predictive alert, or
(2) automated means for runway overrun protection during landing."

Requested Change: Revise the text to read as follows:

"CS 25.705 Runway Overrun Awareness and Avoidance System (ROAAS) (See AMC 25.705)
…
*The ROASS must be a ~~real-time~~ crew ~~alerting~~ **awareness** system that ~~makes energy based assessments of predicted stopping distance versus landing distance available and~~ ~~meets~~ **provides** the following ~~requirements~~:*
*(a) The system must provide the crew with timely in-flight ~~predictive~~ alert **or indication** of runway overrun risk; and*
(b) The system must provide the crew with:
*(1) on-ground ~~predictive~~ alert **or indication of runway overrun risk,** or*
(2) ~~automated~~ means for runway overrun protection during landing."

JUSTIFICATION: Most of the comments in our previous comment addressing paragraph 3.1.1, also apply to this section. Rather than depending upon a system that provides only alerts, some designs might provide other indications to equally improve awareness instead of alerts. Because the awareness can be provided in a pre-emptive manner rather than via an alert once a problem has arisen, the awareness functions may be superior to an alerting system. Therefore, the rule should not prescribe a specific implementation, nor prohibit the use of awareness tools in lieu of alerts.

If an integrated on-ground alert is used, it should be based on stopping distance versus runway remaining, rather than just landing distance available. It is unclear what part of this system needs to be automated. Does this imply there are no inputs required for the awareness system or that the deceleration devices are triggered automatically? More details and clarification are needed.

response

Partially accepted

The Agency will consider the proposed modification during the drafting of the new NPA.

comment

82 comment by: *Boeing*

Page: 10 of 27
Paragraph: *4.c. – Definition of terms - "Predictive Alert"*

The proposed text states:
"c. 'Predictive alert' means that the alert is provided before a problem arises and not during the landing roll, with appropriate consideration of the aeroplane configuration, the runway characteristics and the prevailing environmental conditions (e.g. dry or wet runway)."

Requested Change: Either remove the definition for "*Predictive Alert*" or revise it to read as follows:
*"c. 'Predictive alert' means that the alert is provided ~~before~~ **when** a problem arises ~~and not during the landing roll~~, with appropriate consideration of the aeroplane configuration, the runway characteristics, and the prevailing environmental conditions ~~(e.g. dry or wet runway),~~ **that indicates the crew must take corrective action to avoid a runway end excursion**.*

JUSTIFICATION:

The definition of a "predictive alert" should be changed because it is inconsistent within the use of this NPA.

NPA paragraph 3.1.1(a)(2) and 3.2.2(b)(1) use the term *"on-ground predictive alert,"* whereas Book 2, paragraph 4.c., defines a predictive alert to mean *"the alert is provided before a problem arises and not during the landing roll."*

It is contradictory to require an on-ground alert that is not during the landing roll. If the intent is to only provide the alert during takeoff roll, then the definition and/or requirement must be changed. Based on the data the industry has gathered on runway excursions during landing, and as supported in this NPA, an indication or alert should be provided during the landing roll.

Further, the proposed definition of a "predictive alert" should be changed because it is inconsistent FAA's AC 25.1322 ("Flight Crew Alerting") as well as CS25.1322 ("Flight Crew Alerting").

AC 25.1322 defines an alert as: *"A generic term used to describe a flight deck indication meant to attract the attention of and identify to the flight crew a non-normal operational or airplane system condition."*

The current CS25.1322 states:
"(a) Flight crew alerts must:
(1) provide the flight crew with the information needed to:
(i) identify non-normal operation or aeroplane system conditions. …"

According to this NPA, a predictive alert *"is provided before a problem arises."* We maintain, however, that at no time should an alert be provided unless *"a non-normal operational or airplane system condition"* exists, which is consistent with AC 25.1322. Alerting the crew before a problem has arisen is problematic and conflicts with some flight deck design philosophies. Using the term *"timely alert"* is an adequate description, rather than a "*predictive alert"* that occurs "before a problem arises."

response

Partially accepted

The Agency will consider the proposed modification during the drafting of the new NPA.

comment

83 comment by: *Boeing*

Page: 11 of 27
Paragraph: *6. - Terminology and acronyms*

The proposed text states:
"… "Awareness function' designates the function providing the flight crew with in-flight and on-ground alerting of runway overrun risk; and …"

Requested Change:
*"… "Awareness function' designates the function providing the flight crew with in-flight and on-ground **indications or** alerting of runway overrun risk; and …"*

JUSTIFICATION: Any ROAAS system should be designed to improve aircrew awareness of the runway environment that the airplane is approaching. Crew awareness should not be limited to alerts. Crew awareness can come in the form of aural indications, callouts, tones, displays, alerts, and other flight deck indications. Awareness should be provided as early as possible to prepare the crew for the environment in which they are operating. An alert is one type of indication, but any rule defining ROAAS should allow for other equally effective types of indications as well.

response

Partially accepted

The Agency will consider the proposed modification during the drafting of the new NPA.

comment

85 comment by: *ANACNA*

Since the ROASS makes "energy based assessments of predicted stopping distance versus landing distance available", it is essential that the database used takes the actual landing distance available in duly consideration. In fact it may have been unexpectedly changed by NOTAMs from the departure time due to many reasons (e.g. the change of runway state due contamination or unexpected works).

We envisage some additional procedure to be in place to make sure that the current value is correctly fed into the ROASS and matched with the minimum landing distance as required by the aiplane flying in that configuration.

response

Noted

The Agency will consider this comment during the drafting of the new NPA.

comment

86 comment by: *Bombardier Aerospace*

Bombardier suggests that a number of additional details be included in the AMC:

1. Hazard level associated with loss of, or misleading, ROAAS indications. BA expects these hazard levels to be consistent with those of a TAWS system.
2. Should the ROAAS provide an alert when the pilot attempts to land on a runway different from the planned destination runway, in order to satisfy CS 25.705 ? If yes, is the ROAAS system expected to automatically recognize a landing intent and identify landing runway, irrespective of the destination runway in the flight plan, and apply the landing performance predictions and alerts to that automatically recognized runway?
3. Are there any implied requirements for potential runway excursion alert during takeoff? For example if takeoff is attempted on a runway different from the planned takeoff runway, or from a surface other than a runway?

4. The AMC should provide a standard for establishing the integrity of the runway database. Bombardier suggests including the following: The runways database should be developed, produced and updated in accordance with EUROCAE document ED76/RTCA DO-200A that provides Standards for Processing of Aeronautical Data.

response *Noted*

The Agency will consider this comment during the drafting of the new NPA.

comment *87* comment by: *Bombardier Aerospace*

Section 4(c) (Book 2, page 10):

1. Why are contaminated runways (standing water, slush, dry & wet & compacted snow, ice) not being mentioned for the ROAAS system? In Table 1 the Wet/Contaminated condition is indicated as the most important cause for landing overruns. If the ROAAS system is designed to handle only dry and wet conditions, Bombardier believes that the risk of runway excursions on contaminated runways will remain as high as before. If the ROAAS system is expected to handle contaminated runways, the system should provide means for the pilot to select the runway condition.
2. Regarding the list of parameters to be taken into account, the AMC should either provide more details or examples (e.g. like thrust reverser usage, autobrake, wind, runway slope, landing weight, Vref increment, etc) on the required aircraft configuration and environmental conditions for the performance prediction calculator, or state that the ROAAS performance calculator must provide results consistent with those of the approved aircraft performance data.

response *Noted*

The Agency will consider this comment during the drafting of the new NPA.

comment *92* comment by: *AEA*

1. Predictive alert and automated means for runway overrun

The proposal for CS 25.705 states that:

"(b) The system must provide the crew with :
(1) on-ground predictive alert, or
(2) automated means for runway overrun protection during landing"

However, the definition of terms in Book 2 is not in accordance with this proposal. The definition for predictive alert being:

c. "predictive alert" means the alert is provided before a problem arises and not during the landing roll, with the appropriate consideration of the aeroplane configuration, the runway characteristics and the prevailing environmental conditions (e.g. dry of wet runway).

This definition corresponds to in-flight predictive alert but is not applicable to on ground predictive alert.

The causes of runway overruns are multiple, but we can attribute runway overruns to two

main families of factors:
· Flight path: excessive speed (due to unstable approach, tail wind), deep landing … in all those situations, the energy at touchdown point is not compatible with the remaining runway length, taking into account the runway state.
· Ground roll: inadequate braking performance which may due to delayed spoilers or thrust reversers deployment, delayed manual braking, inadequate autobrake selection or runway contamination state worse than expected (example : runway contaminated by standing water while expected wet).

The risks of runway overruns due to flight path are addressed by the in-flight predictive alert and the appropriate response by the crew: rejected landing. In the existing systems (ROPS) two different alerts are generated "IF WET TOO SHORT" (Visual alert) and "RUNWAY TWO SHORT" (Visual alert and aural warning).

The second family of factors must be addressed by on-ground predictive alert and/or automated means for runway protection during landing.

As a general remark, an automated means for runway overrun protection during landing can only use automatic braking at maximum efficiency to avoid a potential overrun. The existing systems (ROPS) uses both an active automated protection in autobrake mode (autobrake at maximum efficiency, as in RTO mode) and a crew alert ("MAX REVERSE, KEEP MAX REVERSE" associated with "MAX BRAKING" when in manual braking mode). In some situations[1], such as contamination state and braking action much worse than expected, the automated protection (maximum braking) is not efficient since braking action is limited by runway friction : the only way to increase deceleration is to keep maximum reverse thrust until full stop (or until there is sufficient runway remaining to stop using idle reverse).

On contaminated runways, when braking action is poor, one can assume that maximum braking is already applied and the only way to increase deceleration is by use of maximum reverse thrust. The development of automated means of protection using reverse thrust adds complexity and may involve certification issues, so any automated means of protection must also include an alert engaging the crew to take action by the use of maximum reverse thrust.

To summarize: any system must include an alert on ground. An automated protection system on ground should be considered as an option to increase efficiency in some cases (mainly on non-contaminated runways[2]).

On new aeroplanes to be certified, an automated system should be considered but, on existing aircraft, an automated system requiring a complete redesign of the braking system will increase the cost of the ROAAS, with a limited added value, when compared to predictive alerts.

We thus propose to change the wordings of the last part of CS 25.705 as follows (and to modify draft opinion Part 20-206 accordingly:
"(b) The system must provide the crew with on-ground predictive alert of runway overrun risk, which may be associated with an automated means of protection during the roll-out.
AMC 25-705 § 4 c should also be modified as follows:
c. in-flight "predictive alert" means the alert is provided before a problem arises and

not during the landing roll, with the appropriate consideration of the aeroplane configuration, the runway characteristics and the prevailing environmental conditions (e.g. dry of wet runway).

The following paragraph AMC 25-705 § 4 e should also be added to AMC 20-705:
e. on-ground "predictive alert" means the alert is provided during the landing roll, when the system detects a risk of runway overrun.

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[1] At the Airbus Flight Safety conference in Bangkok, March 2013, an event involving a ROPS alert on an A380 has been presented: while ATIS indicated a 50 % contamination with traces of wet snow, the friction coefficient, estimated from landing data was close to 0.05, corresponding to wet ice. In this situation, the active part of protection (maximum autobrake) was not effective since braking action was limited by friction), and the crew used maximum reverse thrust following the "MAX REVERSE" alert.
[2] According to regulatory impact assessment, wet/contaminated runway is a factor in 38 % of landing overruns in Europe as well as 66,7 % outside Europe, aquaplaning (indication of contamination by standing water) is a factor in 7.4 % of landing overruns in Europe (16.2 % outside Europe).

response

Partially accepted

The Agency will consider the proposed modifications during the drafting of the new NPA.

comment

110 comment by: *Embraer - Indústria Brasileira de Aeronáutica - S.A.*

Comment:
ROAAS should be a real-time crew awareness system rather than a real-time alerting crew system.

The regulation should point out the desired functionality and not the means by which the functionality is achieved.

ROAAS should be a real-time crew awareness system rather than a real-time alerting crew system.

Reason for comment:
The same reasons specified in comments No. 107, 108 and 109 apply for this item.

Proposed text:

The text passage:

"The ROAAS must be a real-time crew alerting system that makes energy based assessments of predicted stopping distance versus landing distance available, and meets the following requirements:

(a) The system must provide the crew with timely in-flight predictive alert of runway overrun risk; and
(b) The system must provide the crew with:
(1) on-ground predictive alert, or

(2) automated means for runway overrun protection during landing."

should be changed to:

"The ROAAS must be a real-time crew awareness system that makes assessments (e.g.: by energy monitoring, performance monitoring, database extrapolation/comparison etc) of aircraft characteristics and dynamics versus landing distance available, and meets the following requirements:

(a) The system must provide the crew with timely in-flight awareness of runway overrun risk; and
(b) The system must provide the crew with on-ground awareness."

response *Partially accepted*

The Agency will consider the proposed modification during the drafting of the new NPA.

comment *111* comment by: *Embraer - Indústria Brasileira de Aeronáutica - S.A.*

Comment:
Based on the above comments, in order to maintain the NPA consistency, some terms should be added, while others should be removed.

Reason for comment:
To maintain the NPA's consistency with the previous comments.

Proposed text:

The text passage:

"The following definitions should be used when showing compliance with CS 25.705:

a. 'Automated' means that the system functions without any input form the flight crew.
b. 'Runway overrun risk' means a probability that the aeroplane cannot be stopped on the available landing distance.
c. 'Predictive alert' means that the alert is provided before a problem arises and not during the landing roll, with appropriate consideration of the aeroplane configuration, the runway characteristics and the prevailing environmental conditions (e.g. dry or wet runway).
d. 'Timely' means that the alert is provided at a time which corrective action (e.g. go-around) is still possible."

should be changed to:

"The following definitions should be used when showing compliance with CS 25.705:

a. 'Runway overrun risk' means a probability that the aeroplane cannot be stopped on the available landing distance.
b. 'Awareness system' means that some indication is provided to the flight crew, enhancing the perception of the state of the aircraft and its relationship to the world, while also granting to the flight crew the ability to project changes that may occur as the flight progresses. While an alert system is an awareness system, not every awareness system is an

	alert system. An alert system may be necessary, depending on the specific ROAAS design, on the particular aircraft and its flight-deck philosophy. c. 'Timely' means that the indication is provided at a time which corrective action (e.g. go-around) is still possible."
response	*Partially accepted* The Agency will consider the proposed modification during the drafting of the new NPA.

comment	*112* comment by: *Embraer - Indústria Brasileira de Aeronáutica - S.A.* **Comment:** Based on the above comments, in order to maintain the NPA consistency, some terms should be added, while others should be removed. **Reason for comment:** To maintain the NPA's consistency with the previous comments. **Proposed text:** The text passage: "For the purposes of this AMC, the following generic designations and acronyms are used: - 'ROAAS' designates the whole runway overrun awareness and avoidance system, including the awareness function and the avoidance function; - 'Awareness function' designates the function providing the flight crew with in-flight and on-ground alerting of runway overrun risk; - 'Avoidance function' designates the function providing the flight crew with on-ground guidance or automated means for runway overrun avoidance during landing." should be changed to: "For the purposes of this AMC, the following generic designations and acronyms are used: - 'ROAAS' designates the whole runway overrun awareness and avoidance system, including the awareness function and the avoidance function; - 'Awareness function' designates the function providing the flight crew with in-flight and on-ground indication of runway overrun risk; - 'Avoidance function' designates the function providing the flight crew with on-ground guidance for runway overrun avoidance during landing."
response	*Partially accepted* The Agency will consider the proposed modification during the drafting of the new NPA.

comment	*113* comment by: *Embraer - Indústria Brasileira de Aeronáutica - S.A.* **Comment:** ROAAS should be a real-time crew awareness system rather than a real-time alerting crew system.

Reason for comment:
The same reasons specified in comment No. 107 and apply for this item.

Proposed text:

The text passage:

"The limiting conditions and availability of ROAAS should be stated in the AFM as follows:

(a) The AFM should state all limitations and parameters (for instance the landing configurations, the landing weight range, the runway characteristics (slope, surface), and environmental conditions) for which ROAAS performance is demonstrated. In case an aeroplane operation is allowed outside this ROAAS validity domain, it shall be demonstrated that no alerts from the awareness function will be unduly triggered, taking into account specific non-normal procedures.

(b) The AFM should provide approved procedures essential to safe operation, including unambiguous procedures to be applied by the crew in case of ROAAS alert triggering."

should be changed to:

"The limiting conditions and availability of ROAAS should be stated in the AFM as follows:

(a) The AFM should state all limitations and parameters (for instance the landing configurations, the landing weight range, the runway characteristics (slope, surface), and environmental conditions) for which ROAAS performance is demonstrated. In case an aeroplane operation is allowed outside this ROAAS validity domain, it shall be demonstrated that no indications from the awareness function will be unduly triggered, taking into account specific non-normal procedures.

(b) The AFM should provide approved procedures essential to safe operation, including unambiguous procedures to be applied by the crew in case of a ROAAS indication."

response

Partially accepted

The Agency will consider the proposed modification during the drafting of the new NPA.

comment *116* comment by: *UK CAA*

Page No: 10

Paragraph No: 3 Related Material

Comment: Flight Simulation Training Devices should be captured in this change.

Justification: It would be helpful to include related FSTD material.

Proposed Text: Add new sub-paragraph (7) as follows::

"(7) Commission Regulation (EU) 290/2012 amending Commission Regulation (EU) 1178/2011, Aircrew Regulation: ORA.FSTD.110 Modifications - Is the means by which any

	ROAA modifications to simulators will be considered."
response	*Noted* The Agency will consider this comment during the drafting of the new NPA.

comment	*117* comment by: *UK CAA* **Page No:** 11 **Paragraph No:** 7 Human Factors considerations **Comment**: Page 23, Section 4.5.4.2 recognises the need for adaptation of "training crew". However, there is a concern, that whilst it is recognised that Simulators will need to be fitted with ROAA systems and flight crew training conducted, this should be clarified and included in the Human Factors considerations. **Justification:** Page 14, Section 4.1.2 clearly identifies Secondarily affected stakeholders as ATO and FSTD. **Proposed Text:** Add new sub-paragraph (f) to the list as follows: "(f) Flight Crew ROAA simulator training."
response	*Noted* The Agency will consider this comment during the drafting of the new NPA.

comment	*119* comment by: *IATA* The proposal for CS 25.705 states that: *"(b) The system must provide the crew with :* *(1) on-ground predictive alert, or* *(2) automated means for runway overrun protection during landing"* However, the definition of terms in Book 2 is not in accordance with this proposal. The definition for predictive alert being: *c. "predictive alert" means the alert is provided before a problem arises and not during the landing roll, with the appropriate consideration of the aeroplane configuration, the runway characteristics and the prevailing environmental conditions (e.g. dry of wet runway).* This definition corresponds to in-flight predictive alert but is not applicable to on ground predictive alert. The causes of runway overruns are multiple, but we can attribute runway overruns to two main families of factors: • Flight path: excessive speed (due to unstable approach, tail wind), deep landing … in all those situations, the energy at touchdown point is not compatible with the remaining runway length, taking into account the runway state. • Ground roll: inadequate braking performance which may due to delayed spoilers or thrust reversers deployment, delayed manual braking, inadequate autobrake selection or

runway contamination state worse than expected (example : runway contaminated by standing water while expected wet).

The risks of runway overruns due to flight path are addressed by the in-flight predictive alert and the appropriate response by the crew: rejected landing. In the existing systems (ROPS) two different alerts are generated “IF WET TOO SHORT” (Visual alert) and “RUNWAY TWO SHORT” (Visual alert and aural warning).

The second family of factors must be addressed by on-ground predictive alert and/or automated means for runway protection during landing.

As a general remark, an automated means for runway overrun protection during landing can only use automatic braking at maximum efficiency to avoid a potential overrun. The existing systems (ROPS) uses both an active automated protection in autobrake mode (autobrake at maximum efficiency, as in RTO mode) and a crew alert (“MAX REVERSE, KEEP MAX REVERSE” associated with “MAX BRAKING” when in manual braking mode). In some situations, such as contamination state and braking action much worse than expected, the automated protection (maximum braking) is not efficient since braking action is limited by runway friction : the only way to increase deceleration is to keep maximum reverse thrust until full stop (or until there is sufficient runway remaining to stop using idle reverse).

On contaminated runways, when braking action is poor, one can assume that maximum braking is already applied and the only way to increase deceleration is by use of maximum reverse thrust. The development of automated means of protection using reverse thrust adds complexity and may involve certification issues, so any automated means of protection must also include an alert engaging the crew to take action by the use of maximum reverse thrust.

To summarize: any system must include an alert on ground. An automated protection system on ground should be considered as an option to increase efficiency in some cases (mainly on non-contaminated runways).

response *Noted*

The Agency will consider this comment during the drafting of the new NPA.

comment *120* comment by: *IATA*

We thus propose to change the wordings of the last part of CS 25.705 as follows (and to modify draft opinion Part 26-205 accordingly:
(b) The system must provide the crew with on-ground predictive alert of runway overrun risk, which may be associated with an automated means of protection during the roll-out.

response *Partially accepted*

This proposed modification will be considered during the drafting of the new NPA.

comment *122* comment by: *IATA*

AMC 25-705 § 4 c should also be modified as follows:
c. “in-flight predictive alert” means the alert is provided before a problem arises and not

during the landing roll, with the appropriate consideration of the aeroplane configuration, the runway characteristics and the prevailing environmental conditions (e.g. dry of wet runway).

The following paragraph AMC 25-705 § 4 e should also be added to AMC 20-705:
e. "on-ground predictive alert" means the alert is provided during the landing roll, when the system detects a risk of runway overrun.

response

Partially accepted

This proposed modification will be considered during the drafting of the new NPA.

comment

123 comment by: *IATA*

1. Data availability

The efficient use of such a system requires several conditions:

(a) The system is designed according to the certification process, to allow safe operation and to ensure that the system operation will produce safety benefits.
(b) There is an efficient data production process to guarantee accuracy and integrity as well as availability of on-board runway data.
(c) Crews are properly trained to use the system, in order to be able to react in a timely and adequate manner to alerts generated by the system (cf. next paragraph).

Paragraph 8 of AMC 25-705 addresses the accuracy and integrity of the on-board data, but the two other points: data availability and crew training are not addressed and their economic impact is not taken into account in the regulatory impact assessment.

Concerning the on-board data, there are several possibilities:
(a) ROAAS uses the airport navigation system data base (which is the case for ROW/ROPS on A380). In this case, there is no additional data base costs, the data base is regularly updated according to AIRAC cycles, but this data base covers a limited number of airports (usually the destination airports and a limited number of alternates).
(b) ROAAS uses the EGPWS, which is a worldwide data base (used for TAWS TCF function as well as for RAAS), but with less frequent updates. In this case, there is no additional costs but impact of the data update or of missing and/or incorrect data (in case of new runway or runway works) should be considered.
ROAAS uses its own data base, and, in this case, the issue of availability and cost (data base purchase and distribution costs) must be considered in the Regulatory Impact Assessment.

response

Noted

The Agency will consider this comment during the drafting of the new NPA.

comment

126 comment by: *FNAM-French Aviation Industry Federation*

Regarding the part 8 "Aeroplane Flight Manual (AFM) content", page 11, in case of non-availability of the ROAAS, the crew must be informed by specific signals. This non-availability of the ROAAS may be associated to different reasons, which have to be clearly identified.

response | *Noted*

The Agency will consider this comment during the drafting of the new NPA.

comment | *127* comment by: *FNAM-French Aviation Industry Federation*

Regarding the part 9 “Production process, accuracy and integrity of used on-board runway data”, page 11, no description on the data availabilities is explained. It is a major key point for the system, as if the data are not reliable, the system will have no positive impact. Thus, a RIA has to be done on data availabilities in order to consider the best option in term of cost-effectiveness for the operators.

response | *Noted*

The Agency will consider this comment during the drafting of the new NPA.

comment | *133* comment by: *FAA*

There seems to be a mismatch between the wording in the proposed CS 25.705(b)(1) and its associated AMC material. The proposed CS 25.705 (b)(1) states the system must provide "ON-GROUND predictive alert." In comparison, the proposed AMC 25.705 paragraph 4.c states 'predictive alert' means the alert is provided before a problem arises and NOT DURING THE LANDING ROLL (capitalized for emphasis). The phrase "not during the landing roll" could be understood as "in- air" rather than "on-ground". We recommend clarifying the intent and match the AMC wording to that of the rule.

response | *Partially accepted*

The Agency will consider this comment during the drafting of the new NPA. When used, the term ‘on-ground predictive alert’ will be defined.

comment | *134* comment by: *FAA*

The proposed AMC paragraph 8.a states "...it shall be demonstrated that no alerts from the awareness function will be unduly triggered…" Please clarify:

- If this means the awareness function should be disabled when the airplane operates outside of the ROAAS validity domain (and within the certified AFM domain)?
- What about the protection (or avoidance) function which the proposed 25.705(b)(2) requires to be automated? We note that the proposed rule provides the automated protection function as an option to the "on-ground predictive alert" function.

response | *Partially accepted*

The Agency will consider this comment during the drafting of the new NPA. This point will be clarified.

comment | *137* comment by: *ACSS*

The NPA definition of “automated” says that the system functions “without any input from

the flight crew".
This could be interpreted in at least two ways:
1. The system cannot have the provision for any flight crew input, whatsoever.
2. Even if the flight crew does not make any inputs, the system must still function.
Clarification is needed in the NPA that interpretation (2) is the correct interpretation for the term "automated". It would seem to be beneficial if the system were to allow pilot inputs (entry of non-normal runway conditions, cancellation of nuisance alerts, etc.). This would be consistent with other alerting systems such as TAWS that are "automatic" in the sense that it functions even if the pilot doesn't make any inputs but the pilot is allowed to make inputs, such as changing the display range or inhibiting the below glideslope alert when performing a localizer-only approach.
Suggested Change:
Recommend the definition of the term "automated" should be reworded to something similar to the following:
'Automated' means that the system is automatically activated even if the flight crew makes no direct inputs to the system. However, the requirement for an automated system should not be construed to imply that systems are not allowed to accept flight crew inputs.

response

Partially accepted

The Agency will consider this comment during the drafting of the new NPA. When used, the term 'automated' will be defined.

comment *138* comment by: *ACSS*

The definition of "Predictive alert" says that the alert is based on "prevailing environmental conditions (e.g. dry or wet runway)".
The use of the word "prevailing" could be interpreted to mean that the system must know the current, instantaneous condition of the runway before the aircraft even reached the runway. It would seem acceptable for the system to allow the flight crew to enter the reported runway condition, even if the reported condition did not match the instantaneous condition of the runway. Indeed, today when the flight crew calculates their required landing distance they use the reported runway condition, rather than overflying the runway first to inspect for themselves the current runway condition before circling around to land.
Suggested Change:
Recommend that the definition of "predictive alert" be reworded to refer to the "prevailing or reported environmental conditions"

response

Partially accepted

The Agency will consider this comment during the drafting of the new NPA. When used, the term 'predictive alert' will be defined.

comment *139* comment by: *ACSS*

The document states that the AFM should state the system has been demonstrated to have "no alerts" unduly triggered. However, there is no requirement elsewhere to actually demonstrate that the system is 100% perfect such that it will never have an unduly triggered alert. Indeed, in the subsequent section on *Production process, accuracy and integrity of used on-board runway data*, the level of goodness required of the data is to provide an "adequate" level of accuracy and integrity. Realistically, no system created by humans will

	ever be 100% perfect. **Suggested Change**: The hazard level of an incorrect alert should be defined, such as major. It will then follow existing guidance what the acceptable rate for incorrect alerts will be. This rate will be small, but non-zero. As far as the AFM is concerned, it is probably not necessary to state what the probability of an incorrect alert would be, as this information would not be meaningful to the pilot.
response	*Noted* The Agency will consider this comment during the drafting of the new NPA.

comment	*153* comment by: *General Aviation Manufacturers Association / Hennig* The agency places emphasis on "acceptable processes", resulting in "adequate" level of "accuracy and integrity" to allow real-time performance calculations and not mislead the flight crew in section 9 of the NPA. GAMA is concerned that this general language may drive unnecessary requirements into the design of a ROAAS. Additionally, as stated in other comments (125, 144) the focus by the agency alternates between alerting and awareness functionality. GAMA recommends that the agency not make the requirements more stringent than those for a system that provides advisory functionality to better align with the shift to a ROAAS being an awareness system.
response	*Accepted* The Agency will consider this comment during the drafting of the new NPA.

comment	*156* comment by: *DGAC France* - Just before paragraph (a) of CS 25.705, the requirement is to have an “alerting system that makes energy based assessments of predicted stopping distance versus landing distance available”. The words “landing distance available” should be replaced “remaining runway length” - Paragraph CS 25.705 (book 1 subpart D – Large aeroplanes) provides very few elements. This set of provisions should be expanded to better specify the functions that a ROAAS should meet. - The benefit of having a ROAAS display to increase efficiency should be examined, at least for certain categories of aeroplanes (e.g., with MTOM of 45 tons or more) If such a provision were introduced in CS.25.705, it should not be mirrored in CS 26.205 : this requirement would probably be too costly for new deliveries of aeroplanes with existing type certificate.
response	*Partially accepted* The Agency will consider those comments during the drafting of the new NPA.

comment	*157* comment by: *DGAC France*

	The fact that certified ROAAS should be compatible with possible and foreseeable evolutions stemming from e.g. ICAO runway friction harmonisation task force should be introduced in this AMC.
response	*Partially accepted* The Agency will consider this comment during the drafting of the new NPA.

comment	*164* comment by: *Aerospace Industries Association* AIA requests that the text of this section be revised to read as follows: **"CS 25.705 Runway Overrun Awareness and Avoidance System (ROAAS) (See AMC 25.705)** … The ROASS must be a crew awareness system that provides the following: (a) The system must provide the crew with timely in-flight alert or indication of runway overrun risk; and (b) The system must provide the crew with: (1) on-ground alert or indication of runway overrun risk, or (2) means for runway overrun protection during landing." AIA believes that rather than depending upon a system that provides only alerts, some designs might provide other indications to equally improve awareness instead of alerts. Because the awareness can be provided in a pre-emptive manner rather than via an alert once a problem has arisen, such awareness functions would be superior to an alerting system. The rule should not prescribe a specific implementation, nor prohibit the use of awareness tools in lieu of alerts. Furthermore, if an integrated on-ground alert is employed, it should be based on stopping distance versus runway remaining, rather than just available landing distance.
response	*Partially accepted* The Agency will consider the proposed modification during the drafting of the new NPA.

comment	*165* comment by: *Aerospace Industries Association* AIA believes that the definition "predictive alert" should be changed, as it is inconsistent within the use of this NPA> The proposed text of "c" under Definition of Terms presently states: "c. 'Predictive alert' means that the alert is provided before a problem arises and not during the landing roll, with appropriate consideration of the aeroplane configuration, the runway characteristics and the prevailing environmental conditions (e.g. dry or wet runway)." AIA requests that the definition for "Predictive Alert" either be removed or revised to read as follows: "c. 'Predictive alert' means that the alert is provided when a problem arises with appropriate consideration of the aeroplane configuration, the runway characteristics, and the prevailing environmental conditions, that indicates the crew must take corrective action to avoid a

	runway end excursion.
response	*Partially accepted* The Agency will consider the proposed definition of 'predictive alert' during the drafting of the new NPA.

comment	*166* comment by: *Aerospace Industries Association* The proposed text under Paragpah 6 of this section states, in part: "… "Awareness function' designates the function providing the flight crew with in-flight and on-ground alerting of runway overrun risk; and …" AIA requests that the above section of this paragraph be revised to read as follows: "… "Awareness function' designates the function providing the flight crew with in-flight and on-ground indications or alerting of runway overrun risk; and …" Crew awareness should not be limited to alerts. Crew awareness should be provided as early as possible to prepare the crew for the environment in which they are operating, and can come in the form of aural indications, callouts, tones, displays, alerts, and other flight deck indications. While an alert is one type of indication, any rule defining ROAAS should allow for other equally effective types of indications, as well.
response	*Partially accepted* The Agency will consider the proposed definition of 'awareness function' during the drafting of the new NPA.

comment	*168* comment by: *Rockwell Collins, Inc.* 1. Paragraph 3.2.2(a) requires that alerts be given while in-flight while (b)(1) requires an on-ground alert. We request that this apparent conflict be resolved in the NPA. 2. Paragraph 3.2.2 does not discuss the alerts to require timely application of thrust reversers, braking, lift dump, etc. which should all be possible once the aircraft is on-ground. Further, the NPA does not indicate if the alerts are to be directive. 3. Paragraph 3.2.2 requires energy based assessments of predicted stopping distance. The NPA should allow alternative means of overrun protection that do not require calculation of predicted stopping distance. 4. Paragraph 3.2.2 The accuracy of the predicted stopping distance is highly dependent on accurate and harmonized characterization of the actual real time runway contamination conditions. The NPA should inclde information regarding how such information is to be provided to the on-board system. 5. Paragraph 3.2.2 Book 2: There are no established minimum performance standards for ROOAS. As such, this lack of standards hinders development and cerification activities. We understand that development of performance standards can take several years and could put at risk the ability to meet the proposed equipage dates.

6. Paragraph 3.2.2: The draft AMC does not contain sufficient guidance to understand the impact of incorporating the ROAAS into the avionics systems.
a) It does not have a hazard classification;
b) It does not discuss the types of alerts or awareness, to include:
i. Too High or Too Low (In flight)
ii. Go Around (In flight or On Ground)
iii. Thrust Reversers (On Ground)
iv. Brakes (On Ground)
v. Projected landing position longitudinally on the runway. Without this projection safety is not assured
vi. Does not address tower clearances such as land and hold short, side step to a shorter runway on final procedure, etc.
c) Does not discuss the minimum number of alerts
d) Does not discuss the allowable number of false alerts
e) Does not reference a MOPS agreed to by industry
f) Does not indicate whether an aircraft may dispatch with the system INOP.

7. We request that EASA also consider an alternate means of compliance that would permit using existing systems. For example:
a) Think Prevention, not alerting. It is less costly to analyze what could go wrong, and prevent it, than what did go wrong and correct it.
b) For example, a HUD system has all the flight cues available during roll out and landing to provide a much higher level of prevention and awareness during the roll out and landing. The HUD, with flight path and flare guidance symbology, is a proven system to significantly reduce the landing footprint dispersion. Use of this HUD information can assist the pilot in preventing Long Landing, Incorrect Decision to Land, Speed too High and Too High on Approach situations.
c) By adding Runway remaining to the HUD display, the pilot is provided information which can be used to help prevent Late Application of Brakes and Thrust Reversers and Contaminated runway, i.e., ice, standing water, dry or wet snow. The performance of a jet takes into account for specific contamination which has wide ranging performance decrements.

response

Partially accepted

The new approach taken by the Agency (publication of a new NPA and joint development of a technical standard) is a positive reply to the majority of the comments placed by Rockwell Collins.

4. Regulatory Impact Assessment (RIA) - 4.1. Issues to be addressed p. 12-13

comment

5 comment by: *Loganair Limited*

The analysis does not differentiate between Turboprop and Turbojet aircraft. Is the historical likelihood equally applicable to both turboprop and turbojet aircraft? If turboprop aircraft have a lower risk of overrun (The regulations already allow for a 43% safety factor for turboprop airctraft, as opposed to a 67% factor for turbojet aircraft); should the requirement only be applicable to turbojet aircraft?

	Turboprop aircraft are generally more complex and smaller than turbojet aircraft and have limited space for additional systems.
response	*Noted* The fleet of aeroplanes affected will be reconsidered during the drafting of the new NPA.

comment	*19* comment by: *Dassault Aviation* DASSAULT-AVIATION comment on § 4 RIA - 4.1 Issues to be addressed *"These systems may be installed on new aeroplane types, and are proposed as well in production or for retrofit on existing aeroplane types."* This analysis is based mainly on airliners A/C and does not address specifically Business A/C with small number of pax. As mentioned in comments #11 and 12, due to the numerous number of configurations already in Service, DASSAULT-AVIATION considers that implementation of such a feature on all in Service A/C is economicaly not viable. Nevertheless, when a solution is available on new A/C and is applicable on In Service A/C (similar configuration), system upgrades may be proposed also on In service A/C.
response	*Noted* The Agency will consider this comment during the drafting of the new NPA.

comment	*101* comment by: *ERA* ERA: The regionals, up to say ERJ 190, do not come up often in the base data. Using an Australian report for 1998 - 2007, only 21 of 118 accidents were to aeroplanes with 100 seats or less. More importantly, as this is an operational requirement, only EASA operators are affected. In the above mentioned study, only 1 regional aeroplane was operated by an EASA airline. For the larger aeroplanes, 10 of the 97 accidents were to EASA airlines. Of all of the accidents to EASA operators in the 10 year period, only 4 fatalities are recorded.
response	*Noted* The Agency thanks ERA for the analysis. This will be considered for the definition of the fleet of aeroplanes affected by the proposed rule.

comment	*124* comment by: *IATA* 1. <u>Crew training and mix fleet flying</u> The safety benefits of ROAAS depend on the crew response: go-around in case of in-flight predictive alert, and appropriate action (such as applying maximum reverse thrust) in case of on-ground alert. Adequate crew response is not guaranteed if crews are not properly trained. As a consequence, we cannot assume that the system will effectively increase safety if

operational aspects such as crew training are not properly addressed.

When a new aircraft type is delivered with a new system such as ROAAS, specific training for this system training is integrated into the type rating course. This was the case with the introduction of BTV/ROW/ROPS in A380: description of the system was integrated in the A380 CBT and specific simulator exercises were designed to train pilots involving realistic scenarios (in-flight alerts as well as on-ground alerts) and pilot were trained to take action following alerts.

When newly delivered airplanes are equipped with a new system and operators fly a mix fleet with equipped as well as non-equipped aircraft the situation is different. Usually, simulator modifications are available several months (more than one year is not an unusual delay) after delivery of a new system? If only a small part of the fleet is equipped with the ROAAS, simulator equipment may not be available.

- If a small part of the fleet is equipped with ROAAS and the training is limited to CBT, with no realistic simulator scenarios, pilots may not react according to procedures in case of real alert. The efficiency of the system may be limited due to lack of adequate training and lack of familiarization due to the limited number of equipped aircraft.
- If a large part of the fleet is equipped while a small proportion remains without ROAAS equipment, and pilot trained to react to ROAAS alerts, we have to evaluate the impact of the ROAAS equipment on the non-equipped airplane. In the long term, any alerting system changes the behavior of pilots since the absence of alert may be associated with a safe situation. Will the risk of runway overrun increase in the non-equipped part of the fleet?

Our opinion is that the regulatory impact assessment leading to the decision to amend CS-25 and CS-26 to mandate installation of ROAAS into large airplanes produced after a certain date, should be revised and amended to take into account the training and operational factors associated with the introduction of this new system:

- Include training costs in the RIA : simulator modifications (the cost of installation of a system in a simulator is similar to the cost of installation on an aircraft), so we have to include the “fleet” of flight simulators of new aircraft types as well as existing types still in production.
- The impact of mix fleet on the benefits of ROAAS must be evaluated: we cannot consider that the system efficiency will be identical when an operator entire fleet is equipped and when only part of the fleet is equipped. The safety benefits are not linear and proportional to the percentage of equipped airplanes. This impact should also take into account the possible availability of retrofit solutions at a viable economic cost for operators.

response

Partially accepted

The Agency will consider those comments during the drafting of the new NPA and the associated RIA.

The Agency welcomes any additional data from IATA which will better reflect the cost of training in the RIA.

comment

128 comment by: *FNAM-French Aviation Industry Federation*

Today, there is no specific requirement from ICAO and FAA to implement ROAAS. Nevertheless, as explained in the NPA, ICAO is considering the development of international

standards and recommended practices for the prevention of runway excursions.
In the absence of corresponding ICAO standards and FAA rules, the FNAM is suggesting to EASA to avoid premature rulemaking at the European level.
Coordination on the development of this new requirement should be implemented between ICAO, FAA and EASA. What is more, this new requirement will require time and will lead to additional costs for European operators compared to the non-European operators.

response *Noted*

The Agency does not consider rulemaking to be premature with regard to this safety issue.
The new approach proposed by the Agency (publication of a new NPA and joint developement of a technical standard) should ensure harmonisation at international level.

comment *140* comment by: *ACSS*

Page 12, paragraph number 3

"As aviation traffic is expected to continue to grow worldwide as well as in Europe (albeit at a lower rate)14, the number of runway excursions can also be expected to increase further.15"

The report "A Study of Runway Excursions from a European Perspective" referenced in the NPA paragraph identified above, shows that the runway excursion accident rate is greater than one accident per million flights, with approximately 40% of those accidents being landing overruns. The report also pointed out that runway excursions are the most common type of accident reported annually.
The Regulatory Impact Assessment in the NPA estimated that a ROAAS system could prevent a large percentage of runway excursions. The current recommendation of the NPA to only require ROAAS on newly certificated aircraft seems incongruous with previous equipage decisions for life-saving technology and alerting systems, such as TCAS and TAWS which were required to be installed on both new and existing aircraft. The positive impact of both of these systems has been well documented.
Suggested Change:
The NPA should be extended to include both newly built aircraft as well as pre-existing aircraft.

response *Noted*

The Agency welcomes any additional data from ACSS that will allow to reconsider option 3.

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

The agency uses several terms interchangeably throughout the NPA and also does not provide clear definitions for some of the key terms used in the NPA. While the NPA has fundamental issues that need to be resolve before the agency publishes an opinion, the following is a technical issue that the agency must also address as part of its review of comments:

The agency is unclear whether the ROAAS is intended to consider runway contamination. However, the agency's analysis of casual factors (see, Table 1: Most important casual factors for landing overruns) identifies wet/contaminated runway as 38 percent of the casual factor

in Europe and aquaplaning as 7.4 percent of the casual factor.

GAMA notes that some of their existing in-cockpit systems that mitigate runway excursions do not consider runway contamination. GAMA recommends that the agency clarify whether the ROAAS is required to consider runway contamination (including wet runways) as part of its capabilities and, if yes, the intent of the agency is to disqualify systems that help mitigate runway excursions, but do not have this capability.

Additionally, the agency has not clarified whether the ROAAS is expected to automatically recognize landing intent and identify landing runway, irrespective of the destination runway in the flight plan, and apply the landing performance predictions and alerts to that automatically recognized runway including when conducting operations to parallel runways. GAMA recommends that the agency take steps to clarify this expected functionality of the ROAAS.

response *Partially accepted*

The Agency will consider those comments during the drafting of the new NPA and the associated RIA.

comment *176* comment by: *EBAA*

Reference
Table 1 (page13 of 27).

Proposal / comment
Runway Overrun Awareness and Avoidance Systems (ROOAS) as designed today are not taking into account tire pressure calculation.
Proposal to include a function directly linked to the **Tire Pressure Monitoring System (TPMS)** in the ROOAS already in the Runway Overrun Warning phase to eventually trigger a go around message. Study the possibility of a system to inflate tires in-flight in case of deflation with consequent risks of overrun.

Justification
Among the casual factors for landing overruns incorrect tire pressure is missing. As known, aircraft tires can lose up to 5% pressure per day, and a number of issues can arise from landing with a deflated tire (additional strain on the remaining tires, with an increased potential for one or more to subsequently suffer an explosive deflation due to overstress, with higher risk of runway excursions and secondary damage to the aircraft).

response *Noted*

The Agency will consider this proposal during the drafting of the new NPA.
However, it could be considered that tyre pressure monitoring and the system to inflate tyres in flight are outside the scope of this rulemaking task.

comment *182* comment by: *AW Analyst*

"These ROAAS are expected to be effective for the most important factors triggering runway excursions at landing as shown in Table 1". This NPA does not give adequate detailed explanation of a ROAAS and what predictive data it will provide the crew with that is not

	already available to him from other sources, which will mitigate the effect of the leading factors shown in Table 1.
response	*Noted* The Agency will consider this comment during the drafting of the new NPA.

4. Regulatory Impact Assessment (RIA) - 4.1. Issues to be addressed - 4.1.1.Safety risk assessment p. 13-14

comment	*7* comment by: *CAA-NL* 4.1.1. Safety Risk Assessment: We wonder if the FAA (AC) no 91-79 'Runway Overrun Prevention' published in 2007 had substantial influence on the decrease of the numbers in Figure 1 after 2007? Did EASA research the results of this publication? When there was any effective relation, this would influence the figures from Table 2. Further we tried to complete the numbers of Figure one with the statistics on the subject from the EASA annual safety review of 2011 and 2012. We found it difficult to relate these various figures over the years with each other.
response	*Noted* The Agency will consider those comments during the drafting of the new NPA and the associated RIA. The Agency is willing to take into account the effect of other actions, such as AC 91-79, in this new RIA.

comment	*183* comment by: *AW Analyst* The third Para talks about the expected increase in number of runway excursions however as Figure 1 shows after in increasing trend up to 2007 there has been a significant decline in accidents from 2007 to 2010. The data does not support that statement. Para 2.4 gives some explanation for this due to increased awareness and training but there doesn't appear to be data supporting credit for ROAAS systems for decreasing this trend.
response	*Noted* The Agency will consider this comment during the drafting of the new NPA and the associated RIA.

4. Regulatory Impact Assessment (RIA) - 4.1. Issues to be addressed - 4.1.2.Who is affected? p. 14

comment	*96* comment by: *ERA* ERA1: NPA does not take into account the aircraft size, except for the 5.7t limit. However, the smaller the aircraft, the lower the risk of runway excursion for the same runways, the lower the fatalities and injuries but the installation cost is basically the same. The RIA should take into account the effectiveness relative to aircraft size/capacity. We suggest a limit

	below/above 60 seats or 45.5t that is generally accepted as the limit between "small" and "large" – large transport category aircraft. ERA2: A look at the data shows that regionals would be unduly affected by this proposal. Offsetting the costs, be they 20K or 40K, on a 50 seater or even a 100 seater aeroplane is a very different process to that for 200+ seaters. If this requirement is to be supported, then an MTOM of 60 tonnes is a good discriminator.
response	*Partially accepted* The Agency will reconsider the fleet of aeroplanes affected during the drafting of the new NPA. The Agency welcomes any aditional data from ERA that can help to better identify the fleet of aeroplanes affected.

4. Regulatory Impact Assessment (RIA) - 4.1. Issues to be addressed - 4.1.3.How could the issue/problem evolve? p. 15

comment	*169* comment by: *Rockwell Collins, Inc.* The analysis shown in Table 2 does not take into account the potential beneficial impact of training or procedural mitigations to overrun accidents. These statistics assume nothing more can be done in training or use of alternative certified equipment to prevent expansion of the problem. We recommend inclusion of narrative regarding training considerations.
response	*Noted* The Agency will consider the proposed modification during the drafting of the new NPA and the associated RIA.

4. Regulatory Impact Assessment (RIA) - 4.3. Policy options p. 16

comment	*170* comment by: *Rockwell Collins, Inc.* We request that the Agency consider training and procedural mitigations as a Policy Option.
response	*Noted* The Agency will consider this request during the drafting of the new NPA and the associated RIA.

4. Regulatory Impact Assessment (RIA) - 4.4. Methodology and data (only for a full RIA) - 4.4.2.Data collection p. 17

comment	*71* comment by: *Honeywell* It is stated that "*As far as the safety impact is concerned, it is assumed that the rate at which the ROAAS are introduced in the fleet determines the safety impact of a particular option."* The safety impact will also normally depend on the system design and functionality

	it provides to the flight crew. It is not clear how this has been factored into the safety impact assessment.
response	*Noted* The Agency will consider this comment during the drafting of the new NPA and the associated RIA.

4. Regulatory Impact Assessment (RIA) - 4.5. Analysis of impacts p. 17-18

comment	*20* comment by: *Dassault Aviation* DASSAULT-AVAITION comment on RIA - 4.5. Analysis of impacts *"Option 2 mandates the installation of ROAAS on new types and all newly delivered aeroplanes to be operated by European commercial air transport operators from 2017."* As there is no existing solution available on the shelf for DASSAULT-AVIATION A/C, this ROAAS requirement will lead to a specific development effort, considered not compatible with 2017 mandate. Studies are in progress in order to evaluate impact of such developement effort. In any case, development effort for application of this system may be found impractical on in production buisness jets. Considering the current situation (see comments # 13 and 19), DASSAULT-AVIATION could not commit to a 2017 mandate for in-production A/C and propose to limit applicability of this requirement to the case of A/C with more than 20 pax. However, modified requirements in CS-25 for DASSAULT-AVIATION new types can be met.
response	*Partially accepted* The Agency will reconsider the fleet of aeroplanes affected and the timeline of the implementation during the drafting of the new NPA.

comment	*72* comment by: *Honeywell* Option 0 states that "As the technology is available and can be certified based on CRIs, it can be assumed that the technology will be introduced at a very limited to negligible rate into the fleet." It is not clear how this conclusion was reached - the supporting analysis to derive this conclusion should be presented to industry in the NPA . Honeywell's experience suggests that for newly developed cost-effective safety systems, European operators of large aeroplanes are leaders in the introduction of these flight safety technologies as they tend to be early adopters of such technologies. The historical data associated with European operator adoptation rates of new flight safety systems, EASA discussions with those operators and/or operator surveys should be considered to objectively determine adoptation rates
response	*Partially accepted* The Agency will consider those comments during the drafting of the new NPA.

comment	*99* comment by: *ERA* ERA Member: is in favour of the mandate for newly built aircraft after 2017, however we request that the RIA is split between aircraft with a maximum capacity of 60 seats and aircraft above this capacity (or by MTOW limit) and that, according to the result, the mandate may be revised to affect only higher capacity aircraft.
response	*Partially accepted* The Agency will reconsider the fleet of aeroplanes affected during the drafting of the new NPA.

comment	*100* comment by: *ERA*
response	*Noted*

comment	*142* comment by: *General Aviation Manufacturers Association / Hennig* EASA proposes that the ROAAS be applied, per Option 2, to all new types and all new deliveries three years after the entry-into-force of the regulation. GAMA is concerned that the Regulatory Impact Analysis (RIA) hasn't fully considered the impact on business jet models currently in production. GAMA makes this assertion based on the lack of fidelity with regard to what aeroplane models are captured in the RIA's reference to aeroplane types and also the reference to commercial air transport operators. An example is the agency's review of "Option 1" (while not decided to be the way forward) in which EASA states that "if there are 20 types then each type has 5% share in the total deliveries" and with respect to "Option 2" which states that it "mandates the installation of ROAAS on new types and all newly delivered aeroplanes to be operated by European commercial air transport operators from 2017" (NPA on page 18). The proposed mechanism of applying ROAAS to transport category aircraft is through an amendment to Part-26 which is applicable to all business jets and airline aeroplanes type certificated under CS-25 standards. A brief review of airplane deliveries during 2012 points to significant variation in the number of aeroplanes delivered by different models and also a larger number of models currently in-production compared to the agency's RIA references. According to Airbus, ATR, Boeing (through the research firm Speednews) and GAMA respectively the distribution of deliveries worldwide by model is as follows. Airbus currently produces seven model families with significant variation in the production rates [2012: A318 (2), A319 (38), A320 (332), A321 (83), A330 (101), A340 (2), and A380 (30)]. Boeing currently produces seven models [2012: B737-700 (9), B737-800 (362), B737-900 (44), B767 (26), B777 (83), B747-8 (31) and B787 (46)]. Bombardier produces a mix of commercial airliner aeroplanes and business jets for a total of fourteen unique models [2012: CRJ700/900/1000 (14), Q400 (36), LJ40/45 (24), LJ60 (15), CL300 (48), CL605 (34), G5000/6000 (54), CL850/870/890 (4)]. Embraer produces a mix of commercial airliner aeroplanes and business jets for a total of six unique models [2012: E170 (1), E175 (20), E190 (62), E195 (23), Legacy 650 (17), Legacy 1000 (2)]. ATR produces two models [2012: ATR42 (4), ATR 72 (60)]. Cessna

Aircraft Company produces three transport category business jets [2012: CE-560 (31), CE-680 (22), and CE-750 (6)]. Dassault Falcon Jet produces three business jets [2012: F900LX (7), F2000LX (22), and F7X (37)]. Gulfstream Aerospace Corporation produces seven business jet models [2012: G150/200 (11), G350/450/500/550/650 (83)]. And, Hawker Beechcraft Corporation produced two model [2012: H900XP (17), H4000 (12)].

The total number of transport category models is Airbus (7), ATR (2), Boeing (7), Bombardier (14), Cessna (3), Dassault (3), Embraer (6), Gulfstream (7), and Hawker Beechcraft Corporation (2) for a total of approximately 51 models. EASA seems to identify approximately 20 transport category aeroplanes currently in production (NPA at 18), but there are currently approximately 51 in production. GAMA requests that EASA clarify whether the agency intended to apply the Part-26 requirement to all transport category aeroplanes or only those in scheduled commercial air transport service? If the intent is all transport category models, has the RIA fully considered the aggregate engineering cost across a minimum of 51 different models?

Additionally, from the above included analysis the agency will see the significant variation in the volume of production between business jets (between 6 and approximately 37 per year) and airplanes in scheduled airliner service (such as the Airbus A320 at 332 and Boeing B737-800 at 362). GAMA notes that EASA has spent significant time identifying an approximate per-unit cost for the ROAAS at between EUR 17,000 and 23,000 for new aircraft (NPA on page 23). GAMA requests that the agency review this analysis and determine the different in sunk engineering cost and per-unit equipment purchase between different production rates for large production rate aeroplanes (such as the A320 and B737) and other models and the appropriateness of the proposed CS-26 applicability. This is especially important for lower production rate models where the aggregate cut-in implementation will far exceed the agency's cost estimate. GAMA recommends that the agency consider narrowing the applicability of the CS-26 for ROAAS equipment to aeroplanes with a passenger seat configuration above 20 passenger seats.

Finally, as the agency knows, there are also many small business jets (that is, those type certified to CS-23 standards with select special conditions from CS-25) and it is important that the agency as part of this rulemaking clarify its intent to apply any CS-26 requirement to small business jets. GAMA would note that exempting small business jets from this CS-26 requirement would help mitigate cost.

response *Partially accepted*

The Agency thanks GAMA for the analysis.
The fleet of aeroplanes affected will be reconsidered during the drafting of the new NPA.

comment *171* comment by: *Rockwell Collins, Inc.*

It is not clear whether the Agency has considered the economic cost of installing and certifying ROAAS on newly delivered aeroplanes (Option 2), since there are no included estimations. We request that this information be provided if available.

response *Partially accepted*

The Agency considered those costs as much as possible in the RIA. They will be more evident in the new NPA and its associated RIA.

4. Regulatory Impact Assessment (RIA) - 4.5. Analysis of impacts - 4.5.1.Safety impact p. 18-20

comment *73* comment by: *Honeywell*

It is stated "*A thorough analysis of the past events for European operators indicated that nearly half of the observed 51 serious incidents and accidents shown in table 3 could have been prevented by a ROAAS system*." However, the details of the analysis are not provided - this is a key piece of information required in a document such as this. Thus it is not clear how this result was derived.

The Flight Safety Foundation's (FSF) Approach and Landing Accident Reduction (ALAR) task force identified a very strong link between unstable approaches and their contribution to overruns [Ref 1]. It is not clear how this has been accounted for in the analysis leading to the NPA. It is also unclear how the merits of many of FSF's recommedations are accounted for in the NPA safety impact analysis. The ALAR Task Force presented very concrete recommendations with respect to crew training, SOPs development, no-fault go-around policies, etc.

Furthermore, assumptions about system design (e.g., type of alert and triggering conditions, provision of audio and visual cues, expected response of flight crew to alerts, etc) will impact the analysis. It is not clear how these factors were incorporated into the analysis.

The FSF has recently initiated a new go-around industry safety initiative [Ref. 2]. Ref. 2 provides evidence that a potentially hazardous outcome has been noted in many go-arounds, for various reasons including poor execution of the go-around itself. It is unclear how the outcome of any go-around initiated as a result of a ROAAS alert was assessed in the analysis. The safety risk associated with a go-around should be considered in such analysis given the recent industry activity attempting to address this very specific issue.

[1] Reducing the Risk of Runway Excursions, Flight Safety Foundation, May 2009.

[2] Flight Safety Foundation/EUROCONTROL Go-around Safety Forum, 18 June 2013

response *Partially accepted*

The Agency will consider those comments during the drafting of the new NPA and the associated RIA.

comment *102* comment by: *ERA*

ERA: It is also of note that EASA, in the NPA, finds the proposal effective in only half of the accidents that it bases its proposals on. The justification is weak and the burden on the operator of the smaller aeroplanes is very great.

response *Noted*

The Agency will consider this comment during the drafting of the new NPA.

4. Regulatory Impact Assessment (RIA) - 4.5. Analysis of impacts - 4.5.1.Safety impact - 4.5.1.2 Diversion, delay, and cancellation costs avoided p. 21-22

comment

84 comment by: *Boeing*

Page: 22 of 27
Paragraph: *4.5.4. – Economic impact*

Boeing requests that more detail be provided in this section of the NPA with regard to the assumptions behind the cost assessment. Specifically, what costs are captured in the cost estimate? While paragraph 4.5.4.2 details what costs are not covered, it is not clear what costs actually are captured, for example, in the cited "EUR 17 000 to EUR 39 000 per airframe."

It is not clear whether the cost of development, certification, production changes, implementation across various airplane models, and requisite training has been assessed or even considered. It is very likely that a predictive alert as defined in this NPA, which fully accounts for all of the considerations mentioned, would cost much more than the estimated cost provided in the RIA.

Further, the NPA makes no mention of its requirements in relation to the Changed Product Rule. Applicants would have to step up to the new requirement on all production airplane models by introducing new capability. The RIA neither mentions the costs entailed for this, nor if those costs justify cut-in implementation vs. installation only on significantly changed products.

JUSTIFICATION: In order to provide substantive comments on the Regulatory Impact Assessment, we request more detailed information on the assumptions within the EASA assessment. If the intent is to account for all runway conditions and environmental conditions, this assessment is too low, considering the additional parameters and processing that would be needed.

response

Partially accepted

The Agency will consider those comments during the drafting of the new NPA and the associated RIA.

The Agency welcomes any additional data from Boeing that would help develop a RIA with the most realistic and complete figures.

4. Regulatory Impact Assessment (RIA) - 4.5. Analysis of impacts - 4.5.4.Economic impact - 4.5.4.1 Costs p. 22-23

comment

74 comment by: *Honeywell*

It is unclear how the unit cost data noted in this section of the NPA were derived – for full transparency such details should be explictly presented in the NPA as the associated data are driving the recommendation of a forward-fit requirement only. Based on

	Honeywell's experience, the actual costs in practice may well exceed those stated in the NPA for the type of system functionality described in the NPA (especially for retrofit cases where complex trade-offs need to be usually made). We further believe that an alternative implementations of ROAAS that provides even greater safety benefits could be implemented for both new aircraft and for retrofit at lower costs than those given here and noted in Table 7. Such alternative implementations are excluded from consideration due to the prescriptive nature of the ROAAS requiremements set forth in the NPA.
response	*Partially accepted* The Agency will consider those comments during the drafting of the new NPA and the associated RIA. The Agency welcomes any additional data from Honeywell which will help develop a RIA with the most realistic figures.

comment	*98* comment by: *ERA* ERA: EASA request input from stakeholders on this (4.5.4.1). The estimates used for the RIA are 17k-23k for forward fit and 29k-39k for retrofit. The offers received were in the upper third range of these estimates, but they include other functionalities such as runway incursion prevention.
response	*Noted* The Agency welcomes any additional data from ERA which will help develop a RIA with the most realistic figures.

comment	*114* comment by: *Embraer - Indústria Brasileira de Aeronáutica - S.A.* **Comment:** Given that the requirements in the NPA are specified in such a "generic" manner, it is difficult to accurately predict the costs involved, but development of somewhat similar systems in the past have required a non-recurring cost of approximately €30 million. The per-airplane system costs have typically been about €75,000. Assuming the non-recurrent cost is amortized over a significant production run of 500 airplanes, that results in an approximate per airplane cost of €135,000. Based on past history, Embraer believes that this is a more likely cost than the NPA estimate of €17,000 to €39,000. **Reason for comment:** Estimate of development cost of ROAAS system. **Proposed text:** Adjust the cost calculation in Section 4.5.4 to reflect a higher value.
response	*Partially accepted* The Agency welcomes any additional data from Embraer which will help develop a RIA with the most realistic figures.

comment *130* comment by: *FNAM-French Aviation Industry Federation*

EASA requests input from stakeholders on this article. The estimates used for the RIA are 17k-23k for forward fit and 29k-39k for retrofit. The offers the operators may receive are in the upper third range of these estimates, but they include other functionalities such as runway incursion prevention. Ths, the estimation given by EASA should be related to the entire cost involved by this new requirement.

response *Noted*

The Agency thanks FNAM for this input.
The Agency welcomes any additional data from FNAM which will help develop a RIA with the most realistic figures.

comment *142* ❖ comment by: *General Aviation Manufacturers Association / Hennig*

EASA proposes that the ROAAS be applied, per Option 2, to all new types and all new deliveries three years after the entry-into-force of the regulation. GAMA is concerned that the Regulatory Impact Analysis (RIA) hasn't fully considered the impact on business jet models currently in production.

GAMA makes this assertion based on the lack of fidelity with regard to what aeroplane models are captured in the RIA's reference to aeroplane types and also the reference to commercial air transport operators. An example is the agency's review of "Option 1" (while not decided to be the way forward) in which EASA states that "if there are 20 types then each type has 5% share in the total deliveries" and with respect to "Option 2" which states that it "mandates the installation of ROAAS on new types and all newly delivered aeroplanes to be operated by European commercial air transport operators from 2017" (NPA on page 18).

The proposed mechanism of applying ROAAS to transport category aircraft is through an amendment to Part-26 which is applicable to all business jets and airline aeroplanes type certificated under CS-25 standards. A brief review of airplane deliveries during 2012 points to significant variation in the number of aeroplanes delivered by different models and also a larger number of models currently in-production compared to the agency's RIA references.

According to Airbus, ATR, Boeing (through the research firm Speednews) and GAMA respectively the distribution of deliveries worldwide by model is as follows. Airbus currently produces seven model families with significant variation in the production rates [2012: A318 (2), A319 (38), A320 (332), A321 (83), A330 (101), A340 (2), and A380 (30)]. Boeing currently produces seven models [2012: B737-700 (9), B737-800 (362), B737-900 (44), B767 (26), B777 (83), B747-8 (31) and B787 (46)]. Bombardier produces a mix of commercial airliner aeroplanes and business jets for a total of fourteen unique models [2012: CRJ700/900/1000 (14), Q400 (36), LJ40/45 (24), LJ60 (15), CL300 (48), CL605 (34), G5000/6000 (54), CL850/870/890 (4)]. Embraer produces a mix of commercial airliner aeroplanes and business jets for a total of six unique models [2012: E170 (1), E175 (20), E190 (62), E195 (23), Legacy 650 (17), Legacy 1000 (2)]. ATR produces two models [2012: ATR42 (4), ATR 72 (60)]. Cessna Aircraft Company produces three transport category business jets [2012: CE-560 (31), CE-680 (22), and CE-750 (6)]. Dassault Falcon Jet produces three business jets [2012: F900LX (7), F2000LX (22), and F7X (37)]. Gulfstream Aerospace Corporation produces seven business jet models [2012: G150/200 (11), G350/450/500/550/650 (83)]. And, Hawker Beechcraft

Corporation produced two model [2012: H900XP (17), H4000 (12)].

The total number of transport category models is Airbus (7), ATR (2), Boeing (7), Bombardier (14), Cessna (3), Dassault (3), Embraer (6), Gulfstream (7), and Hawker Beechcraft Corporation (2) for a total of approximately 51 models. EASA seems to identify approximately 20 transport category aeroplanes currently in production (NPA at 18), but there are currently approximately 51 in production. GAMA requests that EASA clarify whether the agency intended to apply the Part-26 requirement to all transport category aeroplanes or only those in scheduled commercial air transport service? If the intent is all transport category models, has the RIA fully considered the aggregate engineering cost across a minimum of 51 different models?

Additionally, from the above included analysis the agency will see the significant variation in the volume of production between business jets (between 6 and approximately 37 per year) and airplanes in scheduled airliner service (such as the Airbus A320 at 332 and Boeing B737-800 at 362). GAMA notes that EASA has spent significant time identifying an approximate per-unit cost for the ROAAS at between EUR 17,000 and 23,000 for new aircraft (NPA on page 23). GAMA requests that the agency review this analysis and determine the different in sunk engineering cost and per-unit equipment purchase between different production rates for large production rate aeroplanes (such as the A320 and B737) and other models and the appropriateness of the proposed CS-26 applicability. This is especially important for lower production rate models where the aggregate cut-in implementation will far exceed the agency's cost estimate. GAMA recommends that the agency consider narrowing the applicability of the CS-26 for ROAAS equipment to aeroplanes with a passenger seat configuration above 20 passenger seats.

Finally, as the agency knows, there are also many small business jets (that is, those type certified to CS-23 standards with select special conditions from CS-25) and it is important that the agency as part of this rulemaking clarify its intent to apply any CS-26 requirement to small business jets. GAMA would note that exempting small business jets from this CS-26 requirement would help mitigate cost.

response *Partially accepted*

The Agency thanks GAMA for the analysis.
The fleet of aeroplanes affected will be reconsidered during the drafting of the new NPA.

comment *167* comment by: *Aerospace Industries Association*

AIA would like to request more detailed information on the assumptions within the EASA assessment in order to provide substantive comments on the economic impact. It is very likely that a predictive alert as defined in this NPA, which fully accounts for all of the considerations mentioned, would cost much more than the estimated cost provided in the RIA.

response *Noted*

The Agency invited stakeholders to provide data that will help develop a RIA with the most realistic figures.

4. Regulatory Impact Assessment (RIA) - 4.5. Analysis of impacts - 4.5.4.Economic impact - 4.5.4.2 p. 23-24

Others costs

comment 8 comment by: *CAA-NL*

4.5.4.2 Other cost

We wonder why in Table 7 there are differences in the costs of Option 1 and 3 from year 2022 onwards? We would have expected that these figures would be the same as all newly delivered aircraft, new TC or old TC, newly produced, have to be delivered with ROAAS installed. This would increase the cost of option 3, however would not change the conclusion based on the key cost effectiveness indicator.

response *Noted*

The Agency will consider this comment during the drafting of the new NPA and the associated RIA. The Agency will ensure that the costs and figures presented therein are clearly explained.

comment 131 comment by: *FNAM-French Aviation Industry Federation*

To get positive results on the ROAAS system, crew must be properly trained to use it, in order to be able to react in a timely and adequate manner to alerts generated by the system. Specific training for this system must be integrated into the type rating course of each aeroplane which will integer the system, which will require simulator modification.
The FNAM is asking to EASA to give more specifications about this subject since only a global assessment on the economic impact is established on part 4.5.4.2., without any precision.
A RIA should take into consideration the crew training and operational factors associated with the introduction of this new system.

response *Partially accepted*

The Agency will consider those comments during the drafting of the new NPA and the associated RIA.

The Agency welcomes any additional data from FNAM to better reflect the cost of additional flight crew training in the RIA.

comment 142 ❖ comment by: *General Aviation Manufacturers Association / Hennig*

EASA proposes that the ROAAS be applied, per Option 2, to all new types and all new deliveries three years after the entry-into-force of the regulation. GAMA is concerned that the Regulatory Impact Analysis (RIA) hasn't fully considered the impact on business jet models currently in production.

GAMA makes this assertion based on the lack of fidelity with regard to what aeroplane models are captured in the RIA's reference to aeroplane types and also the reference to commercial air transport operators. An example is the agency's review of "Option 1" (while not decided to be the way forward) in which EASA states that "if there are 20 types then each type has 5% share in the total deliveries" and with respect to "Option 2" which states that it "mandates the installation of ROAAS on new types and all newly delivered aeroplanes

to be operated by European commercial air transport operators from 2017" (NPA on page 18).

The proposed mechanism of applying ROAAS to transport category aircraft is through an amendment to Part-26 which is applicable to all business jets and airline aeroplanes type certificated under CS-25 standards. A brief review of airplane deliveries during 2012 points to significant variation in the number of aeroplanes delivered by different models and also a larger number of models currently in-production compared to the agency's RIA references.

According to Airbus, ATR, Boeing (through the research firm Speednews) and GAMA respectively the distribution of deliveries worldwide by model is as follows. Airbus currently produces seven model families with significant variation in the production rates [2012: A318 (2), A319 (38), A320 (332), A321 (83), A330 (101), A340 (2), and A380 (30)]. Boeing currently produces seven models [2012: B737-700 (9), B737-800 (362), B737-900 (44), B767 (26), B777 (83), B747-8 (31) and B787 (46)]. Bombardier produces a mix of commercial airliner aeroplanes and business jets for a total of fourteen unique models [2012: CRJ700/900/1000 (14), Q400 (36), LJ40/45 (24), LJ60 (15), CL300 (48), CL605 (34), G5000/6000 (54), CL850/870/890 (4)]. Embraer produces a mix of commercial airliner aeroplanes and business jets for a total of six unique models [2012: E170 (1), E175 (20), E190 (62), E195 (23), Legacy 650 (17), Legacy 1000 (2)]. ATR produces two models [2012: ATR42 (4), ATR 72 (60)]. Cessna Aircraft Company produces three transport category business jets [2012: CE-560 (31), CE-680 (22), and CE-750 (6)]. Dassault Falcon Jet produces three business jets [2012: F900LX (7), F2000LX (22), and F7X (37)]. Gulfstream Aerospace Corporation produces seven business jet models [2012: G150/200 (11), G350/450/500/550/650 (83)]. And, Hawker Beechcraft Corporation produced two model [2012: H900XP (17), H4000 (12)].

The total number of transport category models is Airbus (7), ATR (2), Boeing (7), Bombardier (14), Cessna (3), Dassault (3), Embraer (6), Gulfstream (7), and Hawker Beechcraft Corporation (2) for a total of approximately 51 models. EASA seems to identify approximately 20 transport category aeroplanes currently in production (NPA at 18), but there are currently approximately 51 in production. GAMA requests that EASA clarify whether the agency intended to apply the Part-26 requirement to all transport category aeroplanes or only those in scheduled commercial air transport service? If the intent is all transport category models, has the RIA fully considered the aggregate engineering cost across a minimum of 51 different models?

Additionally, from the above included analysis the agency will see the significant variation in the volume of production between business jets (between 6 and approximately 37 per year) and airplanes in scheduled airliner service (such as the Airbus A320 at 332 and Boeing B737-800 at 362). GAMA notes that EASA has spent significant time identifying an approximate per-unit cost for the ROAAS at between EUR 17,000 and 23,000 for new aircraft (NPA on page 23). GAMA requests that the agency review this analysis and determine the different in sunk engineering cost and per-unit equipment purchase between different production rates for large production rate aeroplanes (such as the A320 and B737) and other models and the appropriateness of the proposed CS-26 applicability. This is especially important for lower production rate models where the aggregate cut-in implementation will far exceed the agency's cost estimate. GAMA recommends that the agency consider narrowing the applicability of the CS-26 for ROAAS equipment to aeroplanes with a passenger seat configuration above 20 passenger seats.

	Finally, as the agency knows, there are also many small business jets (that is, those type certified to CS-23 standards with select special conditions from CS-25) and it is important that the agency as part of this rulemaking clarify its intent to apply any CS-26 requirement to small business jets. GAMA would note that exempting small business jets from this CS-26 requirement would help mitigate cost.
response	*Partially accepted* The Agency thanks GAMA for the analysis. The fleet of aeroplanes affected will be reconsidered during the drafting of the new NPA.

4. Regulatory Impact Assessment (RIA) - 4.5. Analysis of impacts - 4.5.5.General aviation and proportionality issues p. 24

comment *142* ❖ comment by: *General Aviation Manufacturers Association / Hennig*

EASA proposes that the ROAAS be applied, per Option 2, to all new types and all new deliveries three years after the entry-into-force of the regulation. GAMA is concerned that the Regulatory Impact Analysis (RIA) hasn't fully considered the impact on business jet models currently in production.

GAMA makes this assertion based on the lack of fidelity with regard to what aeroplane models are captured in the RIA's reference to aeroplane types and also the reference to commercial air transport operators. An example is the agency's review of "Option 1" (while not decided to be the way forward) in which EASA states that "if there are 20 types then each type has 5% share in the total deliveries" and with respect to "Option 2" which states that it "mandates the installation of ROAAS on new types and all newly delivered aeroplanes to be operated by European commercial air transport operators from 2017" (NPA on page 18).

The proposed mechanism of applying ROAAS to transport category aircraft is through an amendment to Part-26 which is applicable to all business jets and airline aeroplanes type certificated under CS-25 standards. A brief review of airplane deliveries during 2012 points to significant variation in the number of aeroplanes delivered by different models and also a larger number of models currently in-production compared to the agency's RIA references.

According to Airbus, ATR, Boeing (through the research firm Speednews) and GAMA respectively the distribution of deliveries worldwide by model is as follows. Airbus currently produces seven model families with significant variation in the production rates [2012: A318 (2), A319 (38), A320 (332), A321 (83), A330 (101), A340 (2), and A380 (30)]. Boeing currently produces seven models [2012: B737-700 (9), B737-800 (362), B737-900 (44), B767 (26), B777 (83), B747-8 (31) and B787 (46)]. Bombardier produces a mix of commercial airliner aeroplanes and business jets for a total of fourteen unique models [2012: CRJ700/900/1000 (14), Q400 (36), LJ40/45 (24), LJ60 (15), CL300 (48), CL605 (34), G5000/6000 (54), CL850/870/890 (4)]. Embraer produces a mix of commercial airliner aeroplanes and business jets for a total of six unique models [2012: E170 (1), E175 (20), E190 (62), E195 (23), Legacy 650 (17), Legacy 1000 (2)]. ATR produces two models [2012: ATR42 (4), ATR 72 (60)]. Cessna Aircraft Company produces three transport category business jets [2012: CE-560 (31), CE-680 (22), and CE-750 (6)]. Dassault Falcon Jet produces three business jets [2012: F900LX (7), F2000LX (22), and F7X (37)]. Gulfstream Aerospace Corporation produces seven business jet

models [2012: G150/200 (11), G350/450/500/550/650 (83)]. And, Hawker Beechcraft Corporation produced two model [2012: H900XP (17), H4000 (12)].

The total number of transport category models is Airbus (7), ATR (2), Boeing (7), Bombardier (14), Cessna (3), Dassault (3), Embraer (6), Gulfstream (7), and Hawker Beechcraft Corporation (2) for a total of approximately 51 models. EASA seems to identify approximately 20 transport category aeroplanes currently in production (NPA at 18), but there are currently approximately 51 in production. GAMA requests that EASA clarify whether the agency intended to apply the Part-26 requirement to all transport category aeroplanes or only those in scheduled commercial air transport service? If the intent is all transport category models, has the RIA fully considered the aggregate engineering cost across a minimum of 51 different models?

Additionally, from the above included analysis the agency will see the significant variation in the volume of production between business jets (between 6 and approximately 37 per year) and airplanes in scheduled airliner service (such as the Airbus A320 at 332 and Boeing B737-800 at 362). GAMA notes that EASA has spent significant time identifying an approximate per-unit cost for the ROAAS at between EUR 17,000 and 23,000 for new aircraft (NPA on page 23). GAMA requests that the agency review this analysis and determine the different in sunk engineering cost and per-unit equipment purchase between different production rates for large production rate aeroplanes (such as the A320 and B737) and other models and the appropriateness of the proposed CS-26 applicability. This is especially important for lower production rate models where the aggregate cut-in implementation will far exceed the agency's cost estimate. GAMA recommends that the agency consider narrowing the applicability of the CS-26 for ROAAS equipment to aeroplanes with a passenger seat configuration above 20 passenger seats.

Finally, as the agency knows, there are also many small business jets (that is, those type certified to CS-23 standards with select special conditions from CS-25) and it is important that the agency as part of this rulemaking clarify its intent to apply any CS-26 requirement to small business jets. GAMA would note that exempting small business jets from this CS-26 requirement would help mitigate cost.

response

Partially accepted

The Agency thanks GAMA for the analysis.
The fleet of aeroplanes affected will be reconsidered during the drafting of the new NPA.

comment

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

The agency states that to address general aviation proportionality issues "[t]he proposed amendments to CS-25 and CS-26 would ensure a level playing field between all applicants for approval of ROAAS."

To build on GAMA comment number 142, the agency seems to have misunderstood the meaning of proportionality in context of this NPA and its statement in section 4.5.5 for general aviation. First, the safety benefits are vastly different between a typical business jet, which seats between 4 and 19 passengers, and a large scheduled commercial air transport aeroplane, which typically seats 50 to 300 people. Second, the proportional cost impact for new equipment on a smaller transport category aeroplane (which sells for between EUR 3 Million and EUR 40 Million) and a scheduled commercial air transport aeroplane (which sells

	for between EUR 30 Million and EUR 150 Million) is significantly different. Additionally, as discussed in comment 142, the production rates, especially for European customers, is significantly different between the two types of aeroplane markets. GAMA recommends that the agency review the proposed requirements of this NPA and determine whether a threshold can be introduced that would address the issue of cost and safety benefit from the perspective of proportionality including consideration of a passenger seat threshold between typical business jets, at less than 20 seats, and scheduled commercial air transport aeroplanes. Alternatively, the agency could also look at differentiating the mandate for business jets as to whether appropriate safety benefits, in context of cost, are achieved from applying the mandate for business jets to new types only. GAMA notes that if new types only is the framework for the rulemaking for business jets, the agency would reduce the number of affected in-production models from 51 to approximately 26 aeroplanes that are typically used in scheduled commercial air transport service (see comment 142).
response	*Partially accepted* The Agency will reconsider the fleet of aeroplanes affected during the drafting of the new NPA.

comment	*179* comment by: *AW Analyst* ***4.5.5. General aviation and proportionality issues*** The proposed amendments to CS-25 and CS-26 would ensure a level playing field between all applicants for approval of ROAAS. No real data is provided for general/business aviation operations and safety benefits versus cost **Please exclude aircraft under 30 seats/7500kg or cargo OR provide additional research and data for general aviation operations benefits versus cost for this rule.**
response	*Partially accepted* The Agency will reconsider the fleet of aeroplanes affected during the drafting of the new NPA.

4. Regulatory Impact Assessment (RIA) - 4.5. Analysis of impacts - 4.5.6.Impact on ”Better Regulation” and harmonisation p. 24

comment	*75* comment by: *Honeywell* Honeywell agrees that the industry is best served when full regulatory harmonization occurs across mulitiple regulatory and international authorities. Honeywell looks forward to continued participation in this harmonization.
response	*Noted* The Agency thanks Honeywell for its participation.

comment	*129* comment by: *FNAM-French Aviation Industry Federation* Today, there is no specific requirement from ICAO and FAA to implement ROAAS. Nevertheless, as explained in the NPA, ICAO is considering the development of international standards and recommended practices for the prevention of runway excursions. In the absence of corresponding ICAO standards and FAA rules, the FNAM is suggesting to EASA to avoid premature rulemaking at the European level. Coordination on the development of this new requirement should be implemented between ICAO, FAA and EASA. What is more, this new requirement will require time and will lead to additional costs for European operators compared to the non-European operators.
response	*Partially accepted* The Agency does not consider rulemaking to be premature with regard to this safety issue. The Agency has decided to publish a new NPA putting more emphasis on safety objectives against the risk of runway excursions. The means to achieve these objectives will be provided in a technical standard developed jointly by industry and national aviation authorities with the support of an international standardisation body. This should provide for more flexibility and harmonisation.

comment	*172* comment by: *Rockwell Collins, Inc.* The Agency does not indicate when international standards and recommended practices for runway excursion prevention will be available and harmonized across the globe. Such harmonization should be established prior to an EASA NPA.
response	*Noted* The Agency will consider this comment during the drafting of the new NPA.

comment	*180* comment by: *AW Analyst* ***Impact on "Better Regulation" and harmonization*** ICAO is considering the development of international standards and recommended practices for the prevention of runway excursions, and in particular the installation of on-board systems, such as that proposed by this NPA. No discussion of FAA/TC Canada or other authorities. FAA TALPA ARC and AC 20-91 addressed operational recommendations for this area of concern. There is no break out in the NPA of accident and incident data to distinguish elements of the recommended operational considerations such as additional margin in SOPs and improved/consistent runway condition reporting to flight crews versus the proposed system solution. **Delay rule making until further study and international harmonization can confirm that a system solution is 1)actually safer and 2)sufficiently safer to justify the cost of changes to aircraft**
response	*Not accepted*

In the European Action Plan for the Prevention of Runway Excursions, sereval recomendations are made to help reduce the risk of runway excursions.

The installation of on-board systems is part of those recommendations, therefore they are acknowledged at high level. The Agency considers that rulemaking for the approval of such systems is not premature.

4. Regulatory Impact Assessment (RIA) - 4.6. Comparison and conclusion p. 24-26

comment *45* comment by: *THALES AVIONICS*

Applicability	**Page :** P24	**Reference : §4.6**

Current NPA text :
The results of this RIA suggest that Option 2 is the most cost-effective. It creates a significant safety benefit, with an estimated 16 accidents avoided; 11 fatalities and 97 injuries prevented. Thus, the Agency proposes option 2 as it is the most cost-effective option
Thales concern & Rationale for action:
Option 2 is proposed in this NPA as a result of the Regulatory Impact Assessment (RIA) contained in this NPA
However when considering the importance of runway incursions today as expressed by many organizations (EASA, ICAO, FAA, IATA, NTSB, EUROCONTROL), it should be recognized that option 2 reduce only by 40% the number of accidents, fatalities and injuries over 21 years. This success rate seems not sufficiently ambitious when considering the importance of this concern. Moreover, this type of accident is not dependent of the age of the aircraft, or if it would be the case it would conversely more concerns old aeroplane than brand-new aeroplanes that are nowadays fully equipped with several sophisticated system (e.g. glass cockpit, automatic braking, ...) providing the crew with a better control of their aircraft and situational awareness.
Action & rewording proposal:
Therefore, it is suggested that EASA considers Option 3 as the most preferable option, as it would reduce up to 70% the number of accidents, of fatalities and injuries over 21 years.

response *Noted*

The Agency will consider the proposed modification during the drafting of the new NPA and the associated RIA.

comment *56* ❖ comment by: *Airbus*

A new paragraph (b) should be added to 26.205, in order to require ROAAS installation into

all in-service aircraft:

(b) On and after (eight years after the entry into force of this regulation), all large aeroplanes are equipped with a crew alerting system that makes real-time energy based assessments of predicted stopping distance versus remaining runway length. The system shall provide the flight crew with:

(1) timely in-flight predictive caution and/or warning of runway overrun risk, and

(2) on ground predictive warning or automated deceleration means for runway overrun protection during landing.

Justification:

Airbus supports RIA Option 3 for the following reasons:

Option 3 presents a nearly 75% increase in the number of accidents and fatalities prevented by the installation of ROAAS. EASA estimates a further prevention of 12 accidents and 8 fatalities with Option 3 as compared to Option 2.

Airbus recalls that between 25 and 30% of all accidents are runway overruns. Advances in safety have reduced the accident rate to all-time lows, however the rate of runway excursions has not decreased and in fact the overall number of excursions is increasing due to the increased traffic. (Source IATA Safety Reports)

An ROAAS system has the potential to significantly reduce the number of runway excursions and thus contribute greatly to the aviation safety.

Airbus experience has shown that this type of system can be installed both as a line-fit and a retro-fit solution. The associated costs are very similar to the introduction of the TAWS/EGPWS system for which the final FAA rule was published in 2000 and was applicable to all commercial air traffic. The gain in safety of ROAAS can also be similarly compared with the installation of TAWS/EGPWS.

response

Noted

The Agency will consider the proposed modification during the drafting of the new NPA and the associated RIA.

comment

76 comment by: *Honeywell*

The large variance noted in the low and high estimates, especially when comparing Option 2 (New Aircraft ONLY) to Option 3 (New Aircraft and Retrofit), make it even more relevant to review other potential implementations and solutions that could allow for greater “cost effectiveness” that would encompass all commercial air transport aircraft and thereby providing for greater safety benefit at the same or even lower costs than those noted in this NPA.

The large variance noted in the low and high cost estimates in Table 8, especially when comparing Option 2 (New Aircraft ONLY) to Option 3 (New Aircraft and Retrofit), make it even more critical to review other potential implementations and solutions that could allow

for greater "cost effectiveness" that would encompass all commercial air transport aircraft and thereby providing for greater safety benefit at the same or even lower costs than those noted in this NPA. These other implementations could be facilitated by less presciptive ROAAS requirements as previously discussed in our response for Sections 3.1 and 3.2.

response *Partially accepted*

The Agency has decided to publish a new NPA putting more emphasis on safety objectives against the risk of runway excursions.

The means to achieve these objectives will be provided in a technical standard developed jointly by industry and national aviation authorities with the support of an international standardisation body.

This should provide for more flexibility and harmonisation.

comment *95* comment by: *AEA*

Crew training and mix fleet flying
The safety benefits of ROAAS depend on the crew response: go-around in case of in-flight predictive alert, and appropriate action (such as applying maximum reverse thrust) in case of on-ground alert. Adequate crew response is not guaranteed if crews are not properly trained.

As a consequence, we cannot assume that the system will effectively increase safety if operational aspects such as crew training are not properly addressed.

When a new aircraft type is delivered with a new system such as ROAAS, specific training for this system training is integrated into the type rating course. This was the case with the introduction of BTV/ROW/ROPS in A380: description of the system was integrated in the A380 CBT and specific simulator exercises were designed to train pilots involving realistic scenarios (in-flight alerts as well as on-ground alerts) and pilot were trained to take action following alerts.

When newly delivered airplanes are equipped with a new system and operators fly a mix fleet with equipped as well as non-equipped aircraft the situation is different. Usually, simulator modifications are available several months (more than one year is not an unusual delay) after delivery of a new system? If only a small part of the fleet is equipped with the ROAAS, simulator equipment may not be available.

· If a small part of the fleet is equipped with ROAAS and the training is limited to CBT, with no realistic simulator scenarios, pilots may not react according to procedures in case of real alert. The efficiency of the system may be limited due to lack of adequate training and lack of familiarization due to the limited number of equipped aircraft.

· If a large part of the fleet is equipped while a small proportion remains without ROAAS equipment, and pilot trained to react to ROAAS alerts, we have to evaluate the impact of the ROAAS equipment on the non-equipped airplane. In the long term, any alerting system changes the behavior of pilots since the absence of alert may be associated with a safe situation. Will the risk of runway overrun increase in the non-equipped part of the fleet?

Our opinion is that the regulatory impact assessment leading to the decision to amend CS-25 and CS-26 to mandate installation of ROAAS into large airplanes produced after a certain

	date, should be revised and amended to take into account the training and operational factors associated with the introduction of this new system: · Include training costs in the RIA : simulator modifications (the cost of installation of a system in a simulator is similar to the cost of installation on an aircraft), so we have to include the "fleet" of flight simulators of new aircraft types as well as existing types still in production. · The impact of mix fleet on the benefits of ROAAS must be evaluated: we cannot consider that the system efficiency will be identical when an operator entire fleet is equipped and when only part of the fleet is equipped. The safety benefits are not linear and proportional to the percentage of equipped airplanes. This impact should also take into account the possible availability of retrofit solutions at a viable economic cost for operators.
response	*Partially accepted* The Agency will consider those comments during the drafting of the new NPA and the associated RIA. The Agency welcomes any additional data from AEA that will better reflect the cost of training in the RIA.

5. References - 5.3. Reference documents	p. 27

comment	*77* comment by: *Honeywell* The following references are cited in our response and should also be noted: [1] Reducing the Risk of Runway Excursions, Flight Safety Foundation, May 2009. [2] Flight Safety Foundation/EUROCONTROL Go-around Safety Forum, 18 June 2013, Brus
response	*Noted* The Agency thanks Honeywell for the references.

5. Appendix A — Attachments

Comments to EASA CRD to NPA 2013 09 Reduction of runway excursions final.pdf
Attachment #1 to comment #118

Ryanair Comments to NPA 2013.pdf
Attachment #2 to comment #148

A&C-13-216 GAC Response to EASA NPA 2013-09.pdf
Attachment #3 to comment #149

ELFAA Comments to NPA 2013.pdf
Attachment #4 to comment #158

Smart_Landing_Analysis_for_NPA_Response.pdf
Attachment #5 to comment #66

Final NPA Response_Cover Letter_v1.pdf
Attachment #6 to comment #66