COMMENT RESPONSE DOCUMENT (CRD) TO NOTICE OF PROPOSED AMENDMENT (NPA) 2010-03

DRAFT OPINION OF THE EUROPEAN AVIATION SAFETY AGENCY FOR A COMMISSION REGULATION ESTABLISHING IMPLEMENTING RULES PERTAINING TO AIRSPACE USAGE REQUIREMENTS

AND

DRAFT DECISIONS OF THE EXECUTIVE DIRECTOR OF THE EUROPEAN AVIATION SAFETY AGENCY ON ACCEPTABLE MEANS OF COMPLIANCE AND GUIDANCE MATERIAL RELATED TO THE DRAFT IMPLEMENTING RULES FOR AIRSPACE USAGE REQUIREMENTS

AND

DRAFT DECISION OF THE EXECUTIVE DIRECTOR OF THE EUROPEAN AVIATION SAFETY AGENCY AMENDING DECISION NO. 2003/12/RM OF THE EXECUTIVE DIRECTOR OF THE EUROPEAN AVIATION SAFETY AGENCY OF 5 NOVEMBER 2003 ON ACCEPTABLE MEANS OF COMPLIANCE FOR AIRWORTHINESS OF PRODUCTS, PARTS AND APPLIANCES (« AMC-20 »)

'Introduction of ACAS II software version 7.1'

Explanatory Note

I. General

1. The purpose of the Notice of Proposed Amendment (NPA) 2010-03, dated 25 March 2010 was to propose a draft Opinion for a Commission Regulation that mandates the carriage of ACAS II with collision avoidance logic version 7.1, and a draft Executive Decision on Acceptable Means of Compliance (AMC) and Guidance Material (GM) in support of the proposed Implementing Rules. Also included in the NPA was a draft Decision of the Executive Director of the European Aviation Safety Agency amending Decision No 2003/12/RM of the Executive Director of the European Aviation Safety Agency of 5 November 2003 on Acceptable Means of Compliance for Airworthiness of Products, Parts and Appliances (« AMC-20 »).

II. Consultation

2. NPA 2010-03 was published on the website (http://www.easa.europa.eu) on 26 March 2010.

   By the closing date of 7 May 2010, the European Aviation Safety Agency ('the Agency') had received 175 comments from 33 National Aviation Authorities, professional organisations and private companies.

III. Publication of the CRD

3. All comments received have been acknowledged and incorporated into this Comment Response Document (CRD) with the responses of the Agency.

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

   - **Accepted** – The comment is agreed by the Agency and any proposed amendment is wholly transferred to the revised text.
   - **Partially accepted** – Either the comment is only agreed in part by the Agency, or the comment is agreed by the Agency but any proposed amendment is partially transferred to the revised text.
   - **Noted** – The comment is acknowledged by the Agency but no change to the existing text is considered necessary.
   - **Not Accepted** – The comment or proposed amendment is not shared by the Agency

   The resulting text highlights the changes as compared to the current rule.

5. The Agency's Opinion and the Executive Director's Decision amending Decision No 2003/12/RM of the Executive Director of the European Aviation Safety Agency of 5 November 2003 will be issued at least two months after the publication of this CRD to allow for any possible reactions of stakeholders regarding possible misunderstandings of the comments received and answers provided. The Acceptable Means of Compliance and Guidance material will be published as soon as practical after the adoption of the Agency Opinion

6. Such reactions should be received by the Agency not later than **16 November 2010** and should be submitted using the Comment-Response Tool at http://hub.easa.europa.eu/crt.

IV. CRD table of comments, responses and resulting text

(General Comments)	-

comment	2	comment by: *Boeing*
	Boeing concurs that the broader issues associated with unclear, or unwanted, ACAS resolution advisories should be addressed by the industry. However, we consider that the costs to the industry of making the ACAS 7.1 change will probably need to be spent again when the next set of ACAS and ADS-B changes are mandated. We believe that operators may justifiably resist making such costly changes, for the very arguable benefit of ACAS 7.1. Boeing continues to maintain that the "LEVEL OFF, LEVEL OFF (LOLO)" Resolution Advisory (RA) could subject the airplane and passengers to unnecessarily aggressive maneuvers that are not needed to ensure safe traffic separation, thus adding unnecessary risk of injury. We consider that any reported problems identified with the "ADJUST VERTICAL SPEED, ADJUST (AVSA)" RA are related to a design issue with airplanes that only show RA guidance on the Vertical Speed Indicator (VSI), not on the Primary Flight Display (PFD) as on Boeing's current production models. We are not aware of any similar problems with crew response to "AVSA" on airplanes with RA guidance on the PFD and, therefore, consider that an industry criteria change is not warranted. We also maintain that Boeing's current implementation of ACAS aural advisories (as in ACAS II Version 7.0) is appropriate. Additionally, retention of "AVSA" is better suited to accommodate future airspace use, with VNAV- and RNP-based paths, compared with "LOLO" (e.g., for NextGen airspace safety and capacity improvement). Use of "LOLO" not only fails to resolve some existing conflict paths and can induce excessive maneuvering, but use of LOLO can potentially lead to unwanted and unnecessary additional ACAS advisories, such as when aircraft are operating on otherwise desirable and safely separated VNAV trajectories, in current and future airspace. Boeing does agree that the RA "reversal" logic is an incremental safety benefit. Boeing supports adding this potential benefit to our airplanes, and other manufacturers' airplanes, if the operators believe it is necessary and cost effective. To best address EUROCONTROL's and EASA's concerns, Boeing recommends that the change to ACAS 7.1 be made optional. We recommend that the industry initiate work at the soonest practical time to develop a more effective short-term and long-term solution to unwanted or ambiguous ACAS advisories, that more effectively addresses both the safety need and evolving airspace compatibility.	
response	*Not accepted*	
	Examination of the incorrect responses to AVSA RA that have occurred in European airspace has indicated that the wrong response is not associated with a particular design showing RA guidance on the Vertical Speed Indicator (VSI), but also includes aeroplanes that display the RA guidance on the Primary Flight Display (PFD) such as on Boeing's current production models. Thus, as the issue is not related to a particular aeroplane type or display method, the Agency therefore considers it appropriate to require the mandated carriage of	

software version 7.1 to correct the identified safety deficiency. The Agency also considers that the introduction of the LOLO requirement will not result in excessive manoeuvres that exceed those currently envisaged by the current RA. Additionally, the data available to the Agency indicate the use of the LOLO RA should reduce the number of unwanted RAs as a coordinated manoeuvre in accordance with a LOLO should not result in the other traffic receiving any additional RA's or in the worst case a reversal RA towards other traffic. The Agency also thanks Boeing for their comments and support that the RA reversal logic change ring and increased safety benefit. However, the evidence available to the Agency with respect to ACAS II encounters with European airspace shows that limited safety gains would be achieved with voluntary implementation of ACAS 7.1 software.

comment	*3*	comment by: *AEA*
	In the interest of flight safety, the AEA stresses the need to mandate TCAS 7.1 on all aircraft as a matter of priority. The AEA members commit to equip their aircraft with TCAS 7.1 as soon as possible whenever feasible ahead of legal mandates. The AEA calls on the European Aviation Safety Agency (EASA) to further fulfil its responsibility as European safety regulator and to issue as a matter of priority an EASA rule requiring all aircraft (EU as well as non-EU) flying through EU airspace to be retrofitted with the new TCAS 7.1: • Newly delivered aircraft should be equipped as soon as service bulletins are available. • Those existing aircraft, which only require a software upgrade, should be retrofitted at the latest within 2 years after availability of relevant Service Bulletins • Those existing aircraft, which require a more extensive hardware upgrade, should be retrofitted at the latest 5 years after the availability of relevant Service Bulletins	
response	*Partially accepted*	
	The Agency thanks AEA for their support for this initiative to mandate the carriage of ACAS II with version 7.1 software. However, the Agency considers inappropriate for newly delivered aircraft a mandate to equip as soon as service bulleting is available to an effective method to use. This does not prescribe any timeframe in which the service bulletins are to be available and has the potential risk to prolong the date until all aircraft are equipped with version 7.1. Likewise, a retrofit requirement to equip 2 years after the availability of the SB also has the potential to delay the date when all aircraft are equipped thus reducing the safety benefits associated with the full implementation of software version 7.1. The Agency therefore considers that mandating a forward fit and a final compliance date is the correct method to achieve the required safety gains. The information available to the Agency indicates that those aircraft requiring an extensive hardware upgrade is minimal and should be accomplishable within the compliance dates. Should this not be possible, the operator may	

request an exemption in accordance with Article 14 of Regulation (EC) No 216/2008 from their state.

comment 12 comment by: *ALL NIPPON AIRWAYS CO.,LTD.*

[BACKGROUND]
ANA has the following TCAS Computers.

Collins TTR-920 for B777, B737-CL, NG and B767 / TOTAL 60 units
Collins TTR-921 for B777 and A320 / TOTAL 63 units
Honeywell TPA-81A for A320, B747-400 and B767 / TOTAL 125 units
Honeywell TPU-67A for DHC-8 Q300 / TOTAL 21 units

TTR-920 must be replaced by modified TTR-921 or TTR-2100(Estimated total cost impact: $6,000,000).
TTR-921, TPA-81A and TPU-67A must be modified(Pricing has not been determined yet, but not small).
Modified TCAS computers may be required to renew the JTAB type certification for radio equipment(12month is required).
NOTE: ANA understands that the EASA rule requires all aircraft flying through EU airspace. However, ANA believes that it may become the standard for other authorities, as this is the first rule to mandate TCAS 7.1 in the world.
[ANA COMMENTS]
Taking into consideration of the cost impact and magnitude of the modification, ANA proposes as follows:
For the retrofit airplanes, separate the compliance data based on the magnitude of the modification.
#1/ Software change only(on board loading, shop loading or ROM replacement) – 5 years after availability of relevant SB.
#2/ Hardware modification is required – 8 years after availability of relevant SB.
#3/ Unit replacement is required – 10 years after availability of relevant SB.

response *Partially accepted*

The Agency thanks ANA for their comments.

The Agency considers inappropriate a mandate to equip as soon as service bulleting is available to an effective method to use. As this does not prescribe any timeframe in which the service bulletins are to be available, this method has the potential risk to prolong the date until all aircraft are equipped with version 7.1. The Agency therefore considers that the mandating of a final compliance date is the correct method to achieve the required safety gains.

However, based on your comments and as a result of additional comments the Agency proposes an amended compliance date as of 1 December 2015.

comment 21 comment by: *Dassault Aviation*

With the deployment of the new ATM, numerous changes in avionics systems will be requested. To avoid too much trouble to the operators and to save cost, the modifications will have to be grouped.
ACAS 7.1 is an improvement, no doubt about that, but this change does not justify by itself the need to update all the aircraft now. Such change must be coordinated with FAA and mandates must be synchronized on both sides of the

	Atlantic.
response	*Not accepted*
	While every effort is made and will continue to be made to ensure —where possible— harmonised mandates requiring aircraft upgrades. In this instance the Agency has identified an unacceptable risk for operation within the European airspace, which has not been identified with the NAS thus necessitating the introduction of version 7.1 to mitigate the identified risk.

comment	*22*	comment by: *UK CAA*
	Paragraph No: All **Comment:** Whilst the current Standardised European Rules of the Air (SERA) consultation is limited to ICAO Annex 2 transposition, the SERA IR mandate requires the content of ICAO Doc 8168 and Doc 4444 (amongst others) to be considered. Therefore, pilot/controller ACAS procedures and RT will be amongst the potential content of subsequent SERA development. It is understood that principles of delineation between SERA, and EASA ATS and OPS material have been proposed, which would ensure that joint controller/pilot requirements and procedures would be captured within SERA, whilst those that are only of specific pertinence to aircraft operators, pilots, controllers, ATS providers, would be specified in their particular IR set. Therefore, EASA must recognise that the elements of this draft IR, which relate to pilot actions and RT procedures, are likely to need to be removed when transposed into the subsequent SERA IR Part B developments. **Justification:** Consistent content and avoidance of duplication.	
response	*Noted*	
	The Agency is currently reviewing the regulation structure to ensure the correct location of such requirements.	

comment	*23*	comment by: *UK CAA*
	Paragraph No: All **Comment:** There are references to both aeroplanes and aircraft in this NPA and it's not always clear that the distinction is intended. It is recommended that these references be reviewed as there are some ACAS installations on rotorcraft and consequently confusion could arise. **Justification:** Clarification	
response	*Accepted*	
	The text of the rule and associated AMC material has been reviewed to ensure the correct use of reference to aeroplane and aircraft.	

comment	*41*	comment by: *Egis Avia*

	The position of Egis Avia is to strongly support the proposed amendment, which could however benefit from some clarifications regarding the extent of the airspace and of the fleet to which the regulation will apply.
response	*Noted*
	The Agency thanks you for your support. The wording is considered to adequately define the effected aeroplanes and area of applicability.

comment	*74*	comment by: *Swiss International Airlines / Bruno Pfister*
	SWISS Intl supports NPA 2010-03 on ACAS II Software 7.1 without further comments.	
response	*Noted*	
	The Agency thanks SWISS International Airlines for your support with this proposal.	

comment	*102*	comment by: *Air Transport Association*
	Attachment #1	
	Please see the attached comments.	
response	*Noted*	
	The Agency thanks the Air Transport Association of America for their comment with respect to NPA2010-03. Although the US Commercial Aviation Safety Team (CAST) has estimated as a result of the data that has been collected within the USA, that for the NAS the event rate may be lower than that estimated in Europe, it should be noted that the airspace construction and usage is different, and without further analysis direct comparison between the two sets could be problematical. While the probability of a mid-air collision of 2.7×10^{-8} per flight hour due to the identified deficiencies with software version 7.0 (i.e. one catastrophic accident in European airspace every three years) has not been occurred since Überlingen in 2002, the operational data collected has identified that there is a significant number of serious incidents for which the analysed indicate that the risk is real and a catastrophic accident only appears to have been avoided by providence. The Agency can concur that the introduction of software version 7.1 will not address the issue of RA “hot Spots”; this is not a function of ACAS logic and can only be addressed though better airspace and procedure design. Regarding the issue of proper flight crew compliance to an RA, although correct and timely response to any alert and collision avoidance instruction is an effective measure to ensure that sufficient separation is maintained, the data collected indicates that incorrect compliance to RAs and in particular the current AVSA RA does occur. Thus, full reliance on flight crew compliance can not be assumed to occur in all cases, therefore the introduction of version 7.1 that provides flight crew with specific instruction will reduce the tendency for incorrect manoeuvres and result in an improved level of safety. The Agency is aware that work has recently commenced within the standardisation organisation to develop suitable MOPS for Hybrid-Surveillance	

	systems and no documentation has to be published yet. The Agency is assuming that it is most probable that ADS-B will be used to improve the tracking of aircraft within the vicinity the collision risk algorithms will remain unchanged from version 7.1 and therefore any version incorporating a hybrid surveillance functionality will have limited benefit on collision avoidance. The Agency is of the opinion that given the observed rate of events and the associated risks, the rapid introduction of use of version 7.1 within the European Airspace is required.

comment	*105*	comment by: *Continental Airlines*
	Continental Airlines is in full agreement with the ATA/FAA comments concerning this TCAS V7.1 ENPRM.	
response	*Noted*	
	See response to comment 102.	

comment	*111*	comment by: *Luftfahrt-Bundesamt*
	The LBA has no comments on NPA 2010-03.	
response	*Noted*	
	The Agency thanks you for your continued support.	

comment	*112*	comment by: *AIRBUS*
	General Comment: Airbus is fully supporting the regulatory initiative. Airbus notes however that proposed compliance target dates (Article 4), in particular for the retrofit aspects (1 March 2014), are very challenging.	
response	*Noted*	
	The Agency thanks you for your continued support. It is the intent of the Agency to propose a challenging schedule to do the identified safety risk.	

comment	*125*	comment by: *Swedish Transport Agency, Civil Aviation Department (Transportstyrelsen, Luftfartsavdelningen)*
	” The Swedish Transport Agency, Civil Aviation Department is supporting the content of the NPA 2010-03.”	
response	*Noted*	
	The Agency thanks you for your continued support.	

comment	*126*	comment by: *Swedish Transport Agency, Civil Aviation Department (Transportstyrelsen, Luftfartsavdelningen)*
	“The Swedish Transport Agency, Civil Aviation Department considers the consultation period for this NPA was too short. The proposed Implementing Rules and Acceptable Means of Compliance must be considered in a broader	

	perspective where the ongoing rulemaking in e.g. the OPS area must be taken into account."
response	*Noted*
	In accordance with Article 6.5 of the Management Board decision 08-2007, the Agency via a letter dated 24th February requested the opinions of the Safety Standards Consultative Committee and the Advisory Group of National Authorities regarding the shorten consultation period for the NPA. The responses received were supportive of the reduced consultation period.

comment	*127*	comment by: *Swedish Transport Agency, Civil Aviation Department (Transportstyrelsen, Luftfartsavdelningen)*
	"The entering into force (timing) of different rules is vital so that there won't be any gap between different flight safety regulations. Furthermore, The Swedish Transport Agency, Civil Aviation Department are not convinced that the best way to introduce a requirement for TCAS II version 7.1 would be in an IR related to ATM/ANS. We believe that the operators may have difficulties in finding the requirement within that context. Rather, we propose that the requirement remain in OPS rules."	
response	*Partially accepted*	
	The full safety benefits of ACAS II with software version 7.1 can only be implemented if all the aircraft are equipped to this latest standard. Therefore, the use of the OPS rules, that are only applicable to EU operators, would not result in total equipage of the aircraft with the airspace. As the use of a rule based on the ATM/ANS previsions of the Basic Regulation will also ensure the applicability to third country operators and any operators of the applicable aircraft types not included within the OPS rules, the full safety benefits of equipping with version 7.1 software can be obtained. However, to ensure continue compliance with the ACAS II equipage requirements as per ICAO Annex 6 the proposed OPS rules will also continue to require the carriage of ACAS II.	

comment	*130*	comment by: *FAA*
	FAA comments on EASA Notice of Proposed Amendment (NPA) 2010-03, Proposal to Mandate TCAS Version 7.1 The FAA Office of Aviation Safety recognizes that TCAS V7.1 offers an improved level of safety under certain operating assumptions, but there are discrepancies between the European and US risk assessments that warrant further evaluation and coordination. Using data and means available to the FAA, the agency has sponsored work to further investigate and assess the hazard posed by these two conditions. The investigation used the latest safety data analysis tools and methods to process Flight Operations Quality Assurance (FOQA), Aviation Safety Action Program (ASAP), TCAS Operational Performance Assessment (TOPA) and Air Traffic Control (ATC) radar data from several years of operations as a means for validating the underlying base rate of the SA01 encounters and opposite responses corresponding to AVSA alerts. While the observed SA01 rate in the US airspace matched European estimates, no instances of unintentional opposite responses to AVSA RAs have been observed. The investigation also	

	leveraged results stemming from FAA sponsored MIT Lincoln Laboratory work that reassessed midair collision risk due to the SA01 geometry. The reanalysis by Lincoln Laboratory was based on actual SA01 encounter data gathered from TOPA as a means to better characterize the distribution of horizontal and vertical miss distances used in previous European safety analyses. The European NMAC rate was found to be overly conservative by a factor of 8 to 16. Applying the 8 to 16 range to the 3 year European estimate indicates that a collision due to these hazards is expected between 24 and 48 years. Conservatively, using the data from the FAA TOPA program, the risk analysis predicts one midair collision of this type roughly every 21 years which is inconsistent with the European rate of one every three years. It should be noted that almost 8 years have elapsed since the Ueberlingen mid-air collision in 2002. This period exceeds the 3 year estimate and shows that the operational experience with V7.0 does not validate the European prediction. Pilot training with an emphasis on following RA guidance will also help mitigate the issues driving SA01 and the AVSA misinterpretation, as both may arise from non-compliance with RA indications. When comparing the risk likelihoods of both aircraft complying to an RA with one aircraft not complying, RTCA/DO-298 documents that full compliance is 4 to 40 times more effective for V7.0, 2 to 30 times more effective for V7.1. And finally, RTCA/DO-298 documents TCAS V7.1 as just 1.1 to 1.6 times more effective than TCAS V7.0 in resolving SA01 encounters when one flight crew does not respond. We believe additional assessments of the data, assumptions, and presumed root causes of the hazardous conditions should be conducted to resolve the risk assessment discrepancy. In light of this, the FAA is in the process of re-evaluating our assumptions and risk assessment, using the most current data that is available and we would like EASA to participate in the effort. Furthermore, the NextGen and SESAR operating environments will likely require changes to TCAS to ensure it remains compatible with the anticipated environment.
response	*Noted*
	The Agency thanks the FAA for the acknowledgement that ACAS II version 7.1 offers improved safety. While it is acknowledged that the observed SA01 rate in the US airspace matched European estimates, it is difficult for the Agency to understand that no instances of unintentional opposite responses to AVSA RAs have been observed within the NAS. Observations of unintentional opposite responses have been identified and continue to be identified within the European airspace. Although it has been estimated as a result of the data that has been collected within the USA that for the NAS the event rate may be lower than that estimated in Europe, it should be noted that the airspace construction and usage is different, and without further analysis direct comparison between the two sets could be problematical. While the probability of a mid-air collision of 2.7×10^{-8} per flight hour due to the identified deficiencies with software version 7.0 (i.e. one catastrophic accident in European airspace every three years) has not occurred since Überlingen in 2002, the operational data collected has identified that there is a significant number of serious incidents for which the analysed indicate that the risk is real and a catastrophic accident only appears

	to have been avoided by providence. Regarding the issue of proper flight crew compliance to an RA, although correct and timely response to any alert and collision avoidance instruction is an effective measure to ensure that sufficient separation is maintained, the data collected indicates that incorrect compliance to RAs and in particular the current AVSA RA does occur. Thus full reliance on flight crew compliance cannot be assumed to occur in all cases, therefore the introduction of version 7.1 that provides flight crew with specific instruction will reduce the tendency for incorrect manoeuvres and result in an improved level of safety. The Agency is fully aware that possible new operating environments introduced by SESAR and NextGen may require changes to the ACAS II logic to ensure compatibility and is of the opinion that given the observed rate of events and the associated risks, the rapid introduction of use of version 7.1 within the European airspace is required.

comment	*131*	comment by: *Honeywell*
	Honeywell has product plans in place that will support the majority of aircraft platforms impacted by the proposed regulation. In some cases the time between service bulletin availability and required compliance date may be less than what is desired by operators to accomplish retrofits in an efficient manner. Honeywell will continue to work with OEMs, Operators and Airworthiness Authorities to address aircraft updates either through product upgrades, accelerated product development, or in certain situations, exemptions, when financially and operationally justifiable.	
response	*Noted*	
	Thank you for the information and your support.	

comment	*133*	comment by: *EUROCONTROL - CND/CoE/AT/AO*
	1. It is understood this NPA does not apply to State aircraft. There is a significant number military transport type aircraft are equipped and operates with TCAS version 7.0. It is important for safety benefit that that maximum population of aircraft are upgrade to TCAS II version 7.1. (a) How is it proposed to ensure that military transport type aircraft are also upgraded from version 7.0 to version 7.1? (b) Currently, the ACAS II equipage is mandatory for military transport type aircraft operating in German airspace. Will military aircraft operating in German airspace not be required to upgrade to TCAS II version 7.1? Provision should be made to ensure that State aircraft are also required to upgrade to version 7.1. 2. Will individual States be allowed to introduce more stringent TCAS II version 7.1 equipage requirement (as it is the case in Germany now)?	
response	*Partially accepted*	
	With respect to comment 1(a) Article 1(2)(a) of the Basic Regulation (Regulation (EC) No 216/2008 as	

amended by Regulation (EC) No 1108/2009) is explicit and states:
"*2. This Regulation shall not apply to:*
(a) products, parts, appliances, personnel and organisations referred to in paragraph 1(a) and (b) ***while carrying out military****, customs, police, search and rescue, firefighting, coastguard or similar activities or services. The Member States shall undertake to ensure that such activities or services have due regard as far as practicable to the objectives of this Regulation;"*

Thus, when a state aircraft is operated as GAT it cannot be stated that the aircraft is carrying out military services, therefore in accordance with this proposed rule these aircraft require to be equipped with the version 7.1 software standard. The text of AUR.ACAS.001 has been amended to clarify the requirement to include reference to when 'operating as General Air Traffic'.

With respect to comment 1(b)
As stated above, all military aircraft wishing to operate as GAT will be required to equip with ACAS II with software version 7.1; this will also be applicable to those aircraft operating as GAT within the German airspace.

With respect to comment 2.
As discussed above, as the rule is applicable to all military aircraft operating as GAT, the Agency sees no need for states to impose additional requirements.

comment	*135*	comment by: *NATS*
	The NPA assumes all reviewers are fully aware of the legal limits of EASA Basic Regulation (e.g. AUR.ACAS.001 says "all operators" and it is necessary to read the Basic Regulation to understand that this does not include military aircraft). This is not necessarily the case, particularly going forward in the fields of ATM and Aerodromes where stakeholders are not familiar with EASA. While it is accepted that the draft legislation itself does not require explanatory material, it would be helpful if NPAs Explanatory Note could provide a little more information to avoid unnecessary comments.	
response	*Noted*	
	Your comment has been noted and will be considered when developing the explanatory notes to future NPAs. However, please note that this proposed regulation will be applicable to military aircraft when operating as General Air Traffic.	

comment	*147*	comment by: *General Aviation Manufacturers Association (GAMA)*
	Attachment #2	
	General Comments: A large number of the aircraft that must be retrofit with ACAS II software version 7.1 currently utilize equippment that meets previous versions of ETSO-C119. To minimize the level of equipment that must be modified, GAMA suggests that the EASA include discussion of antennas, wiring, displays, etc. which have met ETSO-C119b (TSO-C119b) or earlier versions to indicate they are acceptable provided they do not degrade the function and logic changes required by ETSO-C119c. The changes from ETSO-C119c to ETSO-C119b can be broadly categorized as editorial changes, changes to surveillance and changes to collision avoidance (no effect on display or antenna hardware). Additionally the changes to functions from ETSO-C119a to ETSO-C119b include	

	items typically not contained in the antenna nor display. To minimize the cost of upgrades, GAMA suggests the EASA include discussion in guidance material to address these cases (permit antenna and display (etc.) installations to remain in place if certified to previous versions of ETSO when applicable).
response	*Partially accepted*
	AMC 20-15 paragraph 6.6 added.

resulting text	See Appendix A for revised text

TITLE PAGE p. 1

comment	*52*	comment by: *EUROCONTROL - CND/CoE/AT/AO*
	Typo. Is: Airspace User Requirements Should be: Airspace **Usage** Requirements	
response	*Not accepted*	
	The title is correct. The envisaged final extent of the rule is to include all items associated with airspace.	

comment	*104*	comment by: *IATA*

IATA Comment Submission to EASA NPA 2009-3 (ACAS 7.1), dated 5 May 2010

The purpose of this EASA Notice of Proposed Amendment (NPA) is to develop an Opinion on the Implementing Rule for the mandated carriage of ACAS II with collision avoidance logic version 7.1.

This specific issue was also addressed by the ICAO council during the fall of 2009 and published in ICAO International Standards and Recommend Practices (Aeronautical Telecommunications, Annex 10, and Amendment No. 85). The table below provides a comparison of mandated implementation dates:

	Effective date	
	New aircraft	All aircraft
EASA	1 Mar 2012	1 Mar 2014
ICAO	1 Jan 2014	1 Jan 2017

From the table above, it can be seen that EASA is proposing a schedule that is greatly accelerated from that agreed to by ICAO.

IATA supports the mandatory upgrade of ACAS II to the collision avoidance standard 7.1, as we recognize that it provides an improved safety margin during Resolution Advisory events.

IATA also supports the early implementation of this software when it can be accomplished in a cost effective manner, such as new aircraft deliveries.

However, we would like to offer the following comments:

1. There are considerable complexities regarding hardware upgrades for all existing aircraft types, and relative to previous industry comments, the majority of service bulletins have not yet been produced to cover the required hardware/software configuration changes.

2. Using a conservative estimate for costs, and using cost estimate numbers provided by EASA in NPA 2009-3, we estimate that converting 50% of the world fleet to this standard will cost at least $869.7 M Euro, without considering aircraft downtime costs.

Cost estimate details:

All cost estimates we referenced to EASA NPA 2010-3

Cost calculations based on 11,300 aircraft (50% of world fleet)[1]

Figures from table 1 Equipment costs[2]

Manufacturer	New aircraft	Software retrofit	Hardware retrofit
A	0	8,750 (7,500-10,000)	150,000
B	0	8,750 (7,500-10,000)	150,000
C	0	31,250 (7,500-55,000)	150,000

Using costs from the above table, and assuming fleet composition as follows (costs in 1000's of Euros):

Fleet composition>> 20%
2,260 aircraft 30%
3,390 aircraft 50%
5,600 aircraft Total

A	0	29,662.5	840,000.0	869.7 M
B	0	29,662.5	840,000.0	869.7 M
C	0	105,937.5	840,000.0	945.9 M

References:

1. EASA NPA 2010-3 page 24 (8,000 +3,000)
2. EASA NPA 2010-3 pg 25
3. Indicates hardware and software upgrades required

3. The most significant concern is the possibility that the hardware required for ACAS 7.1 will need to be replaced within a short time span to support installation of ADS-B. The design of ADS-B for SESAR has not been finalized, and therefore the ICAO timeline provides a more realistic opportunity to ensure that un-necessary repeated replacements of hardware will be required.

Recommendations

IATA therefore recommends that EASA issue regulations in agreement with the ICAO mandatory timelines, while encouraging the voluntary retrofit at the earliest reasonable time.

	Many of the elevated risk events cited by EASA in the NPA risk analysis were a result of pilot errors in following ACAS 7.0 RA commands. IATA therefore recommends that EASA work with other regulatory agencies to immediately enhance pilot training regarding issues identified by this risk analysis, providing an immediate safety improvement during ACAS RA events. IATA appreciates the opportunity to comment on this important regulatory issue. Signed, Chris Glaeser, Director of Safety, IATA, Montreal
response	*Not accepted*
	The Agency thanks IATA for their comments and support for the introduction of ACAS II with software version 7.1. The Agency has been notified of the compliance dates in Annex 10 that have been agreed and are due to be published shortly. However, the evidence available to the Agency with respect to ACAS II encounters shows that the risk of a catastrophic incident due to the issues identified with version 7.0 within the European airspace requires a rapid introduction of software version 7.1 in order to mitigate the risk. With respect to improved flight crew training in response to RA's, numerous initiatives have been issued in the past including EASA Safety Information Bulletin 2009-16 in an attempt to improve the flight crew response. The information available to the Agency indicated that these past initiatives have had little effect on the observed number of errors caused by flight crew, thus reliance in improved train is considered to be inappropriate and rapid introduction of version 7.1 is a better mitigation of the risks.

comment	*107*	comment by: *U.S. DoD Policy Board on Federal Aviation*
	Request EASA clarify Para #10 and that IR as proposed in the NPA is not applicable to military aircraft.	
response	*Noted*	
	Article 1(2)(a) of the Basic Regulation (Regulation (EC) No 216/2008 as amended by Regulation (EC) No 1108/2009) is explicit and states: *"2. This Regulation shall not apply to:* *(a) products, parts, appliances, personnel and organisations referred to in paragraph 1(a) and (b)* ***while carrying out military****, customs, police, search and rescue, firefighting, coastguard or similar activities or services. The Member States shall undertake to ensure that such activities or services have due regard as far as practicable to the objectives of this Regulation;"* Thus, when a state aircraft is operated as GAT, it cannot be stated that the aircraft is carrying out military services, therefore in accordance with this proposed rule these aircraft require to be equipped with the version 7.1 software. The text of AUR.ACAS.001 has been amended to clarify the requirement to include reference to when 'operating as General Air Traffic'.	

A. Explanatory Note - I. General p. 3

comment	*75*	comment by: *European Cockpit Association*
	ECA fully supports the upgrade of ACAS II software from version 7.0 to version 7.1. The mandatory carriage of ACAS II with collision avoidance logic version 7.1 is paramount to reduce the risk of mid-air collisions.	
response	*Noted*	
	The Agency thanks you for your continued support.	

comment	*76*	comment by: *European Cockpit Association*
	Major parts of the NPA2010-03 are taken verbatim from ICAO PANS-OPS (volume I, Part III, Section 3, Chapter 3). However the distribution of the consistent ICAO material between the Implementing Rule and the Acceptable Means of compliance appears inadequate. In order to assure a strong text, major parts of the draft AMC need to be moved into the IR. In addition the wording needs to be strengthened and aligned with the existing ICAO wording.	
response	*Noted*	
	The Agency thanks ECA for their comment; however it has not indicated which parts of the AMC ECA consider they should be moved into the IR.	

comment	*110*	comment by: *U.S. DoD Policy Board on Federal Aviation*
	Request EASA further amplify and identify what work is underway in the U.S. and Europe to evaluate and characterize the 1090 MHz frequency band in the 2025 time frame. How will future implementation of ADS-B and Mode S affect 1090 MHz frequency band? Or 1090 MHz also affects the TACAN/DME Channels for 3Y, 66X and 66Y, if still operating in 2025. Request EASE discuss why cannot delay implementation and monitor hybrid transponder/TCAS activities.	
response	*Noted*	
	The Agency is aware that work has recently commenced within the standardisation organisation both in the US and Europe to develop suitable MOPS for Hybrid-Surveillance. The correct use of hybrid-surveillance should reduce the RF load on the 1090 MHz frequency. However, no revised documentation has been published to date. The Agency is of the opinion that given the observed rate of events and the associated risks, the rapid introduction of use of version 7.1 within the European airspace is required to mitigate the identified risks. Thus, waiting the addition, the time for a revised hybrid-surveillance MOPS to be available is considered inappropriate given the identified risks.	

A. Explanatory Note - IV. Content of the draft opinion and decision p. 4-5

comment 14 comment by: *Royal Aeronautical Society*

Page 4 EXPLANATORY NOTE IV – Content of the draft opinion and decision

The statement in paragraph 11 that, 'The introduction of this NPA makes the requirement in OPS.GEN.460 obsolete as the high level carriage and operational requirement will no longer be defined in OPS.GEN' is challenged for the following reasons:

(a) The high level requirements for carriage of ACAS II are published in ICAO Annex 6 Parts I and II that establish safety equipment standards for all aeroplanes involved in international commercial air transport and general aviation purposes. These requirements are intended to ensure that the safety benefits ACAS II provides to aeroplanes, passengers and crews apply regardless as to the airspace in which the aeroplane will at that time be flying.

(b) EU-OPS (and JAR-OPS 1 beforehand and Part-OPS to follow) are, have been and will be respectively the documents in which national aviation regulation enforcement agencies in the Community, Community operators and pilots of Community aircraft will naturally expect to find Implementing Rules (IR) that reflect ICAO Standards and Recommended Practices relating to *the carriage of aircraft safety equipment*.

(c) National aviation regulation enforcement agencies in the Community, Community operators and pilots of Community aircraft will naturally expect to find **in Part-OPS** detailed instructions for *the operation* of required safety equipment and guidance on *the associated training* that reflect ICAO publications as they can do now in EU-OPS and its associated reference material (JAA TGL 11).

(d) Concern regarding the duplication of texts within Part-OPS and Part-AUR expressed in the Explanatory Note should not be perceived as an issue of concern because both Parts serve different purposes and are intended to be read by different recipients.

It is therefore appropriate that EASA should prescribe:

(a) In Part-OPS, OPS.GEN.460 the text that is contained in the proposed Part- AUR Subpart ACAS Section II – Equipment (AUR.ACAS.100) and Section III – Operations (AUR.ACAS.200);

(b) In Part-OPS, a new AMC.OPS.GEN.460 that should include the text contained in the proposed AMC.AUR.ACAS.200 'Use of Airborne Collision Avoidance System (ACAS) II'; and,

(c) In Part-OPS, an amended GM OPS.GEN.460 that should include the texts of Attachments A and B to ICAO PANS-OPS Volume I, Part III, Section 3, Chapter 3 because these specify in detail (1) the scope of training that is needed to ensure that pilots do not misuse ACAS II, and (2) pilot action that is recommended to avoid the risk of generating high vertical rate encounters.

EASA is invited to note that these recommendations are consistent with the

	submission made earlier by the Royal Aeronautical Society in its response to NPA 2009-02 yet for the sake of consistency between Part-OPS and Part-AUR the revisions should now reflect texts contained in NPA 2010-03 Part-AUR and Subpart ACAS.
response	*Partially accepted*
	The Agency thanks RAS for their comment. The Agency concurs with your comment regarding the deletion of the requirement to carry ACAS II from the OPS rule. Such a requirement will be kept in PART.OPS. AUR.ACAS.100 has been amended to align with the resulting proposed PART.OPS. PART.OPS is currently undergoing review and your additional comments will be taken into consideration.

comment	*42*	comment by: *Egis Avia*
	The "European airspace" mentioned at the end of para. 9 should be defined precisely. Does the proposed amendment apply to ECAC airspace, to the EASA Member States?	
response	*Noted*	
	The definition of the airspace is given in Annex 1 AUR.ACAS.001.	

comment	*53*	comment by: *EUROCONTROL - CND/CoE/AT/AO*
	Item 9. The current ICAO ACAS II equipage requirement reads: *From 1 January 2005, all turbine-engined aeroplanes of a maximum certificated take-off mass in excess of 5 700 kg or authorized to carry more than 19 passengers shall be equipped with an airborne collision avoidance system (ACAS II).* (Source: ICAO Annex 6; para. 6.18.2) The wording of the NPA's item 9 differs from the ICAO wording. If the departure from the ICAO text is intentional, then the rational should be given. Otherwise, the current wording creates ambiguity and uncertainty which equipage requirement is applicable – ICAO or EASA. If EASA insists on using own wording for the equipage requirements, then the difference to the ICAO Annex 6 should be filed. Moreover, the wording of item 9 does not exclude helicopters, military aircraft or Unmanned Aircraft Systems (UAS). That needs to be clarified. To avoid ambiguity, a definition of "European Airspace" needs to be provided or referred to.	
response	*Noted*	
	The wording of paragraph 9 of the Explanatory Note was intended to address the same population as per the ICAO requirement. The Agency used the term turbine-powered as opposed to turbine-engined. The mandated application is intended for aeroplanes (i.e. not helicopters) by definition of the term aeroplane. However, it is recognised that helicopters have voluntarily equipped	

with ACS II; it is therefore the intent of the rule that these aircraft are also equipped with version 7.1 software.

With respect to military aircraft, when a military aircraft is operated as GAT it cannot be stated that the aircraft is carrying out military services; therefore in accordance with this proposed rule these aircraft require to be equipped with the standard 7.1 software version.

With respect to Unmanned Aircraft Systems (UAS), if the UAS is a fixed-wing aircraft it will be classified as an aeroplane, thus if the UAS is greater than 5700 kg and will be operated in un-segregated airspace as GAT the rule will apply.

The text of AUR.ACAS.001 has been amended to clarify the requirement to include reference to when 'operating as General Air Traffic'

The definition of the airspace is given in Annex 1 paragraph AUR.ACAS.001 and applicable aeroplanes and aircraft is given in Annex 1 paragraph AUR.ACAS.100.

comment	*114*	comment by: *AIRBUS*
	Paragraph 14: The NPA refers to a new issue of the ETSO-C119. ETSO-C119C is already technically up-to-date to support TCAS Change 7.1. EASA should clarify if the wording "issue of revised ETSO-C119" refers to a future version of the ETSO or to the already updated document.	
response	*Noted*	
	ETSO-C119c as mentioned is the standard that is technically correct to support ACAS II with version 7.1 software. It is not the Agency's intent to further update this ETSO standard to support the introduction of version 7.1.	

I Draft Opinion - Implementing Rule – AIRSPACE USAGE REQUIREMENTS (AUR) p. 7

comment	*8*	comment by: *Lufthansa/Lauterbach*
	Attachment #3	
	General comment: Lufthansa is committed to safety improvements and therefore supports a timely introduction of TCAS change 7.1 on newly delivered aircraft. However this safety improvement of **7.1 does create high retrofit costs**, which for the LH fleet alone will be an amount **of about 15 million USD** comment to Article 4 par. 1: For forward fit the proposed date of 1 March, 2012 should be achievable, but it requires the mandate to be issued soon! (experience shows, vendors do only start their program when the mandate is issued) **We do not agree with Article 4 par. 2:** **The retrofit date of 1 March, 2014 is not achievable.**	

	Core Lufthansa Airlines alone needs to replace about 180 aircraft (TCAS computers), as they **(Collins TTR 920) are not modifiable**! A service bulletin may be available late 2011 or only in 2012. Production capabilities at the vendor may allow for 3-4 units per month assigned for Lufthansa. **In consequence this requires approx. 52 month minimum retrofit time** (4 years and 4 month). For the case, that a retrofit requirement is imposed on the industry, a retrofit period of 5 years is required (1 March 2017) Please see also the AEA position paper dated Oct. 5th, 2009 attached.
response	*Partially accepted*
	The Agency considers inappropriate a mandate to equip as soon as service bulleting is available to an effective method to use. As this does not prescribe any timeframe in which the service bulletins are to be available, this method has the potential risk to prolong the date until all aircraft are equipped with version 7.1. The Agency therefore considers that the mandating of a final compliance date is the correct method to achieve the required safety gains. Regarding the mandated carriage compliance date, the Agency notes that the original proposed dates were ambitious. An ambitious compliance is required in order to achieve the full safety benefits associated with version 7.1; however, following additional comments, the Agency has amended the compliance date to the 1 December 2015.

comment	*16*	comment by: *AEA*
	Reference Text Article 4 - Entry into force Comment In the interest of flight safety, the AEA stresses the need to mandate TCAS 7.1 on all aircraft as a matter of priority. The AEA members commit to equip their aircraft with TCAS 7.1 as soon as possible whenever feasible ahead of legal mandates. AEA believes that the rule should require all aircraft (EU as well as non-EU) flying through EU airspace to be retrofitted with the new TCAS 7.1 in the following manner: Newly delivered aircraft should be equipped **as soon as service bulletins are available** . Those existing aircraft, which only require a software upgrade, should be retrofitted at the latest within **2 years after availability of relevant Service Bulletins**. Those existing aircraft, which require a more extensive hardware upgrade, should be retrofitted at the latest **5 years after the availability of relevant Service Bulletins**.	
response	*Not accepted*	
	The Agency thanks AEA for their support. However, the Agency considers inappropriate a mandate to equip as soon as service bulleting is available to an effective method to use. As this does not prescribe any timeframe in which the service bulletins are to be available, this method has the potential risk to	

	prolong the date until all aircraft are equipped with version 7.1. The Agency therefore considers that the mandating of a final compliance date is the correct method to achieve the required safety gains.

comment	*24*	comment by: *UK CAA*
	Page 7, Paragraph No: Draft IR, Article 2, Definitions **Comment:** Definition of 'RA' – what is the source of this definition? ICAO Doc 8168 Sect 3 Chp 3 para 3.1.1 states: 'RAs propose vertical manoeuvres that are predicted to increase or maintain separation from threatening aircraft'. The EASA definition also does not compliment the text used in the AMC.AUR.ACAS.200 para 1.1 which closely reflects ICAO, and neither of which talk about avoiding an airborne collision as used in the EASA definition. **Justification:** Commonality with ICAO and consistency in the IR **Proposed Text:** 'Resolution Advisory (RA) means a proposed vertical manoeuvre predicted to increase or maintain separation from threatening aircraft.'	
response	*Partially accepted*	
	The definitions have been replace by the ICAO Annex 2 and 10 definitions.	

comment	*25*	comment by: *UK CAA*
	Page 7, Paragraph No: Draft IR, Article 2, Definitions **Comment:** Definition of 'TA' – what is the source of this definition? ICAO Doc 8168 Sect 3 Chp 3 para 3.1.1 states: '….traffic advisories (TAs), which are intended to prompt visual acquisition and to act as a warning that an RA may follow. TAs indicate the approximate positions of intruding aircraft that may later cause resolution advisories.' The EASA definition also does not compliment the text used in the AMC.AUR.ACAS.200 para 1.1 which closely reflects ICAO, and neither of which talk about avoiding a potential collision threat as used in the EASA definition **Justification:** Commonality with ICAO and consistency in the IR **Proposed Text:** 'Traffic Advisory (TA) means an indication of the approximate positions of intruding aircraft that may later cause resolution advisories (RA), and are intended to prompt visual acquisition.'	
response	*Partially accepted*	
	The definitions have been replaced by the ICAO Annex 2 and 10 definitions.	

comment	26	comment by: *UK CAA*
	Page 7, Paragraph No: Draft IR, Article 4, Entry Into Force **Comment:** The wording could be improved, without changing its meaning. **Justification:** Clarification. **Proposed Text:** '1. This Regulation shall enter into force on 1 March 2012. 2. Notwithstanding 1, for aeroplanes with an individual certificate of airworthiness issued before 1 March 2012, this Regulation shall only apply after 1 March 2014.'	
response	*Partially accepted*	
	Text amended to clarify the intent.	

comment	43	comment by: *Egis Avia*
	In the last sentence of Article 4, does "Member States" mean "EASA Member States"? If this is actually the case, this should be mentioned explicitly.	
response	*Noted*	
	The proposed Implementing Rule will be a European Commission Implementing Rule, thus it will be binding in all States where the Treaty applies.	

comment	54	comment by: *EUROCONTROL - CND/CoE/AT/AO*
	Article 2. The definitions of ACAS II, Resolution Advisory, and Traffic Advisory differ from ICAO definitions. ***Airborne collision avoidance system (ACAS).*** *An aircraft system based on secondary surveillance radar (SSR) transponder signals which operates independently of ground-based equipment to provide advice to the pilot on potential conflicting aircraft that are equipped with SSR transponders.* (Source: ICAO Annex 2, Definitions, page 1-1) ***Resolution advisory (RA).*** An indication given to the flight crew recommending: a) a manoeuvre intended to provide separation from all threats; or b) a manoeuvre restriction intended to maintain existing separation. (Source: ICAO Annex 10, volume IV, page 4-2) ***Traffic advisory (TA).*** An indication given to the flight crew that a certain intruder is a potential threat. (Source: ICAO Annex 10, volume IV, page 4-3) If the departure from the ICAO definitions is intentional, then the rational should be given. Otherwise, the current wording creates ambiguity and uncertainty which definition is applicable – ICAO or EASA. If EASA insists on using own definitions, then differences to the applicable ICAO Annexes should	

	be filed.
response	*Partially accepted*
	The ICAO Annex 2 and 10 definitions are used as per the comment; however the definition of ACAS does not define ACAS II, therefore the ICAO definition of ACAS II has been added.

comment	*69*	comment by: *Rockwell Collins Inc*
	Article 2, Definitions Resolution advisories provide warning of potential penetration of a predefined boundary around the aircraft. This is not necessarily an "imminent collision threat" unless "collision" is defined as penetration of a predefined boundary. Article 4, Entry Into Force It is recommended that the regulation for ACAS II software version 7.1 enter into force for aircraft fielded before 1 March, 2012 be extended from 1 March 2014 to 31 December 2015 to allow enough time for modification of thousands of ACAS II units in the field. A wide selection of aircraft platform installations with different equipment configurations will require certification updates in order to be compliant. Hundreds of operators will be required to complete modification programs without interrupting service operations. Thus, it is requested to provide until 31 December 2015 for fielded aircraft to be updated compliant to the ACAS II software version 7.1.	
response	*Partially accepted*	
	The definition of a Resolution Advisory had been amended in accordance with ICAO Annex 10 definition. Regarding the Article 4, Entry into force. Resulting from your comments and additional comment, the date by which all aircraft should be equipped with ACAS II software version 7.1 has been amended to 1 December 2015. The Agency is of the opinion that compliance dates at major holiday periods should be avoided so as to ensure correct compliance with the rule.	

comment	*93*	comment by: *FedEx Express*
	Tuesday, May 04, 2010 Process Support Rulemaking Directorate European Aviation Safety Agency (EASA) Postfach 10 12 53 D-50452 Cologne Germany RE: COMMENTS FROM FEDEX REGARDING NOTICE OF PROPOSED AMENDMENT (NPA) NO 2010-03, ACASS II 7.1 **Comments** By publication dated 25 March 2010 EASA requests comments on a proposed amendment to implement ACAS II with collision avoidance logic version 7.1.	

FedEx Express appreciates the opportunity to offer the following comments in regard to subject proposed amendment to ED-143 and DO-185B. In general, FedEx is in favor of making modifications to its aircraft fleet that prove beneficial to improving safety.

However, FedEx Express believes the aggressive schedule related to this Implementing Rule (IR) does not take into consideration normal business processes. Given the significant cost impact of this rule it is impractical to assume we can gain financial approval before it is implemented. With the impending regulation at the end of 2010, gaining financial approval, completing contract negotiations/approvals, obtaining STC approvals and implementing the upgrade during existing maintenance schedules by 1 March 2014 is not practical.

We propose EASA allow this requirement to be phased in during scheduled maintenance checks. Considering normal business processes, financial impact and programmed maintenance schedules we recommend a retrofit requirement date of 1 March 2015.

Steve Fink
Manager, Avionics Engineering - Nav & Surveillance

response *Partially accepted*

The Agency thanks FedEx for their support for the introduction of version 7.1 collision avoidance software. As a result of additional comment, the Agency shall propose a mandatory carriage date of 1 December 2015.

comment *94* comment by: *Boeing*

It appears that this paragraph is meant to provide the retrofit date (i.e., the date for which aircraft that are in-service before 1 March 2012 must meet the new regulation). As written, the language is somewhat confusing and could be interpreted differently.
We recommend revising the text of paragraph 2. to read as follows:
"2. Notwithstanding 1, this Regulation shall enter into force on 1 March 2014 for those aeroplanes with an individual certificate of airworthiness issued before 1 March 2012".

JUSTIFICATION: Our recommended revision would clarify the retrofit requirement.

response *Partially accepted*

Text amended to clarify intent.

comment *103* comment by: *Bombardier Aerospace*

Article 4 - Entry into Force
BA and its suppliers are currently working on TCAS II v7.1 implementation plans for our product line. For most programs, the plans are compatible with the NPA forward fit date of 1 March 2012. However, some equipment is not scheduled to be available until early 2012. BA would not have sufficient time to complete the certification activities prior to 1 March 2012. BA will continue to work with its suppliers to improve the dates but at this time it is considered

	prudent to request a 6 month delay in the forward fit date.
response	*Not accepted*
	The Agency thanks Bombardier for the continued efforts in support to improve the safety airspace users. As the standards for ACAS II version 7.1 are currently available, the Agency is of the opinion that certification activities and production cutting can be achieved by the date of 1 March 2012.

comment	*108*	comment by: *U.S. DoD Policy Board on Federal Aviation*
	Many of the ACAS processors in use in the DoD, and the civilian world, cannot be updated to TCAS v7.1 because they are early versions of v7.0. This will cause significant delays and cost that should be considered in determination of implementation date. Request that EASA take into consideration extending implementation date.	
response	*Accepted*	
	The Agency has taken due note of your comment and other comments relating to the mandatory carriage date and as such the Agency is proposing a revised mandatory carriage date as of 1 December 2015.	

comment	*109*	comment by: *U.S. DoD Policy Board on Federal Aviation*
	The proposed update period is less than the normal 7 years that is typical for equipage requirements. Many equipment manufacturers have indicated that software will not be readily available until 2012 or after.	
response	*Noted*	
	The information available to the Agency indicates that equipment manufactures are able to supply equipment by the specified date.	

comment	*113*	comment by: *AIRBUS*
	Article 1, Applicability: EASA should confirm that the rule will be applicable to all users of the European airspace, and not only to European operators, and the Applicability article should be clarified accordingly.	
response	*Accepted*	
	Text amended to clarify the intent of the rule.	

comment	*136*	comment by: *NATS*
	Article 1 and AUR.ACAS.001 Different wording is used to make the same point regarding scope/applicability. Is this deliberate?	
response	*Noted*	
	The scope and applicability are different as it is the Agency's intent to add	

	additional subparts and annexes to address additional mandatory issues in the future. Thus, Article 1 provides the scope for the additional subparts/annexes to be applicable to all the airspace in which the Treaty applies, and the subparts refine the applicability accordingly.

comment	*148*	comment by: *General Aviation Manufacturers Association (GAMA)*
	Article 2, Definitions (Page 7) – Resolution Advisories provide warning of a potential penetration of a predefined boundary around an aircraft. This is not necessarily an "imminent collision threat" unless "collision" is defined as a penetration of a predefined boundary. GAMA recommends EASA revise this definition to reflect this condition.	
response	*Partially accepted*	
	The definition has been amended to align with ICAO Annex 10.	

comment	*150*	comment by: *General Aviation Manufacturers Association (GAMA)*
	Article 4, Entry into force (Page 7) - It is recommended that the regulation for ACAS II software version 7.1 enter into force for aircraft fielded before 1 March, 2012 be extended from 1 March 2014 to 31 December 2015 to allow enough time for modification of thousands of ACAS II units in the field. A wide selection of aircraft platform installations with different equipment configurations will require certification updates in order to be compliant. Hundreds of operators will be required to complete modification programs without interrupting service operations. Thus, it is requested to provide until 31 December 2015 for fielded aircraft to be updated compliant to the ACAS II software version 7.1.	
response	*Partially accepted*	
	Resulting from your comments and additional comments, the date by which all aircraft should be equipped with ACAS II software version 7.1 has been amended to 1 December 2015. The Agency is of the opinion that compliance dates at major holiday periods should be avoided so as to ensure correct compliance with the rule.	

comment	*160*	comment by: *Roland Mallwitz*
	Pg 7, AUR Article 4: The current dates do not match with ICAO decisions requiring ACAS II Version 7.1 from 2014 for new and 2017 for existing installations. Although earlier dates were discussed the dates above have been agreed for 2 reasons: There is no question about the safety benefit of Version 7.1. But there are questions on the actual amount of this benefit. There are some indications that the assumptions within the calculation of the risk ratio have been too conservative. With the current implementation plans of surveillance technologies it has to be expected that the performance of surveillance systems SSR, SSR Mode S, ADS-B and ACAS II in high density areas may suffer due to the use of common	

	frequencies. Current ACAS implementations contribute in high density areas to the RF load with about 50%. The problem could be reduced or even overcome by implementation of an improved Hybrid Surveillance. It would be beneficial, in particular for the high density traffic areas in core Europe, if such a requirement could be included in the rule. There is a chance that this could be achieved by aligning the dates in the rule with the ICAO mandate.
response	*Not accepted*
	The Agency is fully aware of the ACAS II introduction dates of 2014 and 2017 as agreed by ICAO. However, the Agency is of the opinion, supported by the incident reports and analysis, that there is a significant safety risk with the European airspace. In order to mitigate this risk, the carriage of ACAS II version 7.1 is required and to obtain the greatest benefit an aggressive schedule is required. Therefore, in order to obtain the greatest safety benefit, the Agency is proposing a schedule that is faster than ICAO's. The Agency is aware of the issues associated with the current implementation plans for surveillance technologies and the anticipated affect on RF load. Although the envisaged introduction of hybrid surveillance is intended to reduce the RF load, according to the information available to the Agency the application of the current standard will not achieve the anticipated reduction. Thus, given the safety concerns, the Agency considers it inappropriate to wait for the new standards to be developed.

comment	*169*	comment by: *IFATCA*
	Comment: Resolution Advisory (RA) means a warning to the flight crew of an imminent collision threat, combined with ~~commands~~ indications for the crew to use in avoiding an airborne collision. Justification ACAS does not consider all threats to the aircraft, for example stall warning, wind shear and ground proximity warning system alerts have precedence. (NPA page 10 Note 1). The ACAS procedures (see below)[1] use the term "unless", which also indicates that it is certainly not a command.. The term command is therefore too strong. The term "ACAS Indicator" is used as the section title in NPA page 9 section 2. The term indicators or indications should therefore be used instead of commands. [1] AUR ACAS 200: B) 1. The pilot flying shall immediately take the corrective action indicated by the RA, even if this conflicts with an Air Traffic Control (ATC) instruction, unless doing so would jeopardise the safety of the aeroplane	
response	*Partially accepted*	
	Definition amended to align with ICAO Annex 10.	

resulting text	See Appendix A for resulting text

I Draft Opinion - Implementing Rule – AIRSPACE USAGE REQUIREMENTS - ANNEX 1 p. 8

comment	*4*	comment by: *AEA*

Reference text
AUR.ACAS.200 Use of ACAS II *(a) ACAS II shall be used in normal conditions during flight in a mode that enables Resolution Advisories (RAs) to be produced for the flight crew when undue proximity to another aircraft is detected.*

Comment
AEA belives this language is imprecise. We suggest to amend it with the following wording

Proposed Change
(a) ACAS II shall be used ~~in normal conditions~~ during flight in a mode that enables Resolution Advisories (RAs) to be produced for the flight crew when undue proximity to another aircraft is detected, ***unless inhibition of RA mode (using 'TA' only or equivalent) is called for by a non-normal procedure.***

response	*Partially accepted*

Text amended, as proposed, however the term “non-normal” has be replaced by “abnormal” for consistency

comment	*6*	comment by: *AEA*

Reference text
1.3
Note 2: The normal operating mode of ACAS II is TA/RA. The TA only mode of operation is used in certain aeroplane performance limiting conditions caused by in-flight failures or as otherwise promulgated by the Competent Authority.

Comment
This text implies that in normal conditions, TA only mode can be used. Therefore the implementing rule cannot ask for the TA/RA mode to be used permanently. For example AFM:
Select TA for:
- Dispatch with landing gear down
- Engine failure
- Operation near closely spaced parallel runway (less than 1 200 ft).

Proposed Change
AUR.ACAS.200 Use of ACAS II
(a) ACAS II shall be used during flight in a mode that enables Resolution Advisories (RAs) to be produced for the flight crew when undue proximity to another aircraft is detected, **unless the TA only mode of operation is used due to** aeroplane performance limiting conditions caused by in-flight failures or as otherwise promulgated by the Competent Authority.

response	*Partially accepted*
	Text amended to incorporate the intent of the comment.

comment	*27*	comment by: *UK CAA*
	Page 8, Paragraph No: AUR.ACAS.100, Performance Requirement **Comment:** There are some ACAS installations on rotorcraft. Should paragraph (c) then apply to those? **Justification:** Clarification	
response	*Accepted*	
	Text amended to refer to aircraft.	

comment	*28*	comment by: *UK CAA*
	Page 8, Paragraph No: AUR.ACAS.100, Performance Requirement, Para (c) **Comment:** Section AUR.ACAS.100 para (c), the wording "any other aeroplane equipped with ACAS II" does not fit in to the main clause ending "…. aeroplanes which :" **Justification:** Editorial **Proposed Text:** "(c) are equipped with ACAS II".	
response	*Accepted*	
	Text amended to aid clarification.	

comment	*29*	comment by: *UK CAA*
	Page 8, Paragraph No: AUR.ACAS.200, Use of ACAS II, Para (a) **Comment:** Para (a) appears to prevent the use of ACAS II in TA-only mode in accordance with aircraft operator Operations Manuals or where circumstances dictate. Is this the intended purpose (see ICAO Doc 8168 Pt 1 Chap 3 para 3.1.3 Note 2 and AMC.AUR.ACAS.200 para 1.3 Note 2)? **Justification:** Clarification**.**	
response	*Accepted*	
	Text amended to clarify the intent.	

comment	30	comment by: *UK CAA*
	Page 8, Paragraph No: AUR.ACAS.200, Use of ACAS II, Para (b) **Comment:** If the intention is to paraphrase ICAO Doc 8168 PANS-OPS Pt 1 Chap 3 para 3.2 and the proposed AMC.AUR.ACAS.200, then at the very least a new sub-para should be added. **Justification:** Consistency with ICAO **Proposed Text:** AMC.AUR.ACAS.200 new sub-para 2: 'the pilot shall not manoeuvre in the opposite sense to an RA'; Renumber the current sub-para 2 as 3.	
response	*Not accepted*	
	The inclusion of the proposed sub-paragraph is considered not to be necessary since the obligation in sub-paragraph 1 is already clear, i.e. “the pilot flying shall immediately conform to the indications of the RA”.	

comment	31	comment by: *UK CAA*
	Page 8, Paragraph No: AUR.ACAS.200, Use of ACAS II Para (b) **Comment:** It is essential that ATC are informed of a TCAS RA as soon as possible. This is required by ICAO Doc 8168 para 3.2 4) and should be included in the IR material rather than the AMC.ACAS.200 para 2.1 c) 4) and 8). **Justification:** Minimises the potential for ATC to give instructions contrary to the RA **Proposed Text:** ‘(b) When an RA is produced by ACAS II, 1. the pilot flying shall immediately take the corrective action indicated by the RA, even if this conflicts with an Air Traffic Control (ATC) instruction, unless doing so would jeopardise the safety of the aeroplane, ~~and~~ 2. as soon as possible, as permitted by flight crew workload, notify the appropriate ATC unit of any RA which requires a deviation from the current ATC instruction or clearance; and 3. when clear of conflict is enunciated, the aeroplane shall be promptly returned to the terms of the acknowledged ATC instruction or clearance, and ATC notified.’	
response	*Accepted*	

	Text amended.

comment	44	comment by: *Egis Avia*
	In para. AUR.ACAS.001, does "Member States" mean "EASA Member States"? If this is actually the case, this should be mentioned explicitly.	
response	*Accepted*	
	The phase 'to which the Treaty applies' has been added to the proposed rule for clarification.	

comment	45	comment by: *Egis Avia*
	Regarding para. AUR.ACAS.100, the text should use the same terminology as the current EUROCONTROL ACAS II mandate. Consequently, the beginning of this paragraph should read: "ACAS II, with collision avoidance logic version 7.1, shall be carried and operated by all civil, fixed-wing turbine-engined aircraft having (a) a maximum take-off mass exceeding 5700 kg or (b) a maximum approved passenger seating configuration of more than 19"	
response	*Not accepted*	
	The wording is consistent with ICAO requirements.	

comment	46	comment by: *Egis Avia*
	Regarding the first point of para (b) in AUR.ACAS.200, the first sentence should be modified because some TCAS RAs do not require a corrective action from the pilot, but rather restrict him in the range of possible manoeuvres (e.g. "Don't Descend" RA issued onboard a level aircraft because of a threat below). Consequently, the text should read: "the pilot flying shall immediately conform to the indications of the RA, even if this conflicts ..."	
response	*Accepted*	
	Text amended.	

comment	55	comment by: *EUROCONTROL - CND/CoE/AT/AO*
	AUR.ACAS.001 "...flights within the airspace above the territory of the Member States." That potentially differs from item 9 on page 4 which talks about "European airspace". Also, the above wording suggests that the scope of regulation is not applicable over territorial waters and airspace over high-seas which is controlled by the Member States.	

That needs to be clarified.

AUR.ACAS.200

The wording of this section differs from the applicable ICAO provisions (PANS-OPS ICAO Doc 8168, part VIII para. 3.2.).

The best approach might be referring to applicable ICAO provisions rather then providing new, potentially ambiguous, wording.

If the departure from the ICAO text is intentional, then the rational should be given.

response *Partially accepted*

With respect to AUR.ACAS.001, the intent of the proposed paragraph is as interrupted, i.e. not applicable to the territorial waters and airspace over the high-seas controlled by Member States.

With respect to AUR.ACAS.200 the text has been amended to align with ICAO.

comment *70* comment by: *Rockwell Collins Inc*

Annex 1, Section III
AUR.ACAS.200, part(b) 2) Clarify that "Clear of Conflict" may not always be issued.
Add wording similar to the Note in AC20-151A, Appendix A, Section III; "The threat
aircraft track or altitude information can be lost during an RA. If so, the RA will terminate without a "Clear of Conflict" annunciation."

response *Partially accepted*

The text has been amended to delete the phrase ‘Clear of Conflict is enunciated’ and is replaced by ‘the conflict is resolved’.

comment *77* comment by: *European Cockpit Association*

Comment on Annex I, Section III – Operations AUR.ACAS.200 Use of ACAS II new item (a): change as follows:

(a) ACAS II indications shall be used by the flight crew in the avoidance of potential
collisions, the enhancement of situational awareness and the active search for and visual
acquisition of, conflicting traffic.

Justification : the correct follow up of ACAS II indications is crucial for avoiding conflicting traffic. In addition the wording should remain conform with the wording used in ICAO Doc 8168 Part III chapter 3 3.1.1 (“ACAS II indications **shall** be used”). It should be noted that ICAO provisions in general use the term “shall” only when such a provision is “recognised necessary for the safety of air navigation”. In consequence, this key requirement from ICAO PANS-OPS should be part of the IR and not of the AMC.

response	*Not accepted*
	The issuance of Resolution Advisors is considered to be the safety critical function of the ACAS II system, hence the intent of paragraph (a) is to ensure that the ACAS II system is used in flight in a manner that will permit the issuance of Resolution Advisors. It is therefore not the intent of this paragraph to make a mandatory reference to the situational aware (i.e. TA mode).

comment	*78*	comment by: *European Cockpit Association*
	Comment on Annex I, Section III – Operations AUR.ACAS.200 Use of ACAS II new item (b): change as follows: **(b) Nothing in the procedures specified in item AUR.ACAS.300 hereunder shall prevent flight crew from** **exercising their best judgement and full authority in the choice of the best course of** **action to resolve a traffic conflict or avert a potential collision**. Justification: the correct follow up of ACAS II indications is crucial for avoiding conflicting traffic. In addition the wording should remain conform with the wording used in ICAO Doc 8168 Part III chapter 3 3.1.1 (“ACAS II indications shall be used”). It should be noted that ICAO provisions in general use the term “shall” only when such a provision is “recognised necessary for the safety of air navigation”. In consequence, this key requirement from ICAO PANS-OPS should be part of the IR and not of the AMC.	
response	*Not accepted*	
	The intent of the proposed text in included in paragraph (b).1.	

comment	*79*	comment by: *European Cockpit Association*
	Comment on Annex I, Section III – Operations AUR.ACAS.200 Use of ACAS II old item (a): change as follows: From ~~(a)~~ ACAS II shall be used in normal… To **(c)** ACAS II shall be used in normal… Justification: renumber to item (c) if the comment on the new item (a) and (b) is withheld. After new items (a) and (b) from PANS-OPS 3.1.2 and 3.1.3 are accepted, the existing subparagraph (a) with roots in ICAO Note 2 to PANS-OPS 3.1.3 needs to be renumbered to retain the flow from ICAO PANS-OPS.	
response	*Not accepted*	
	European Cockpit Association Comments 77 and 78 have not been accepted.	

comment	*80*	comment by: *European Cockpit Association*
	Comment on Annex I, Section III – Operations new AUR.ACAS.300 Use of ACAS Indicators: change as follows: **AUR.ACAS.300 USE OF ACAS INDICATORS**	

	The indications generated by ACAS II shall be used by the flight crew in conformity with the following safety considerations: **a) flight crew shall not manoeuvre their aeroplane in response to TAs only;** **b) on receipt of a TA, flight crew shall use all available information to prepare for appropriate action if an RA occurs;** **and** **c) in the event of an RA, flight crew shall:** **1) respond immediately by following the RA as indicated, unless doing so would jeopardise the safety of the aeroplane;** **2) follow the RA even if there is a conflict between the RA and an Air Traffic Control (ATC) instruction to manoeuvre;** **3) not manoeuvre in the opposite sense to an RA;** **4) as soon as possible and as permitted by flight crew workload, notify the appropriate ATC unit of RA's which required a deviation from the current ATC instruction or clearance;** **5) promptly comply with any modified RAs;** **6) limit the alterations of the flight path to the minimum extent necessary to comply with the RAs;** **7) promptly return to the terms of the ATC instruction or clearance when the conflict is resolved;** **and** **8) notify ATC when returning to the current clearance.** Justification: the correct use of ACAS II indications is crucial for avoiding conflicting traffic. In addition the wording should remain conform with the wording used in ICAO Doc 8168 Part III chapter 3 3.2 ("flight crew **shall** "). It should be noted that ICAO provisions in general use the term "shall" only when such a provision is "recognised necessary for the safety of air navigation". In consequence, this key requirement from ICAO PANS-OPS should be part of the IR and not of the AMC.
response	*Partially accepted*
	The new paragraph AUR.ACAS.300 has not been added; however, as a result of this comment and others, the text has been amended to be in conformance with ICAO.

comment	*81*	comment by: *European Cockpit Association*
	Comment on Annex I, Section III – Operations old item (b): change as follows: Delete Justification: the proposed item (b) can be deleted if the comment above on the new item AUR.ACAS.300 is withheld as it is a duplication of c)1 and c)7.	
response	*Not accepted*	
	The proposed paragraph AUR.ACAS.300 has not been added.	

comment	*82*	comment by: *European Cockpit Association*
	Comment on Annex I, Section III – Operations old item (c): change as follows: From	

	~~(c)~~ ACAS II training… To **AUR.ACAS.400 ACAS II Training** ACAS II training programmes… Justification: renumber to new item AUR.ACAS.400 because the section does not deal with the use of ACAS but with the establishment of training programs.
response	*Partially accepted*
	Para AUR.ACAS.300 ACAS II Training added.

comment	*83*	comment by: *European Cockpit Association*
	Comment on Annex I, Section III – Operations old item (c): change as follows: AUR.ACAS.400 ACAS II training ACAS II training programmes shall be established so that the flight crew: 1. are appropriately trained in the avoidance of collisions, and 2. are competent in the use of ACAS II equipment. **ACAS II Training Guidelines for Pilots are provided in AMC.AUR.ACAS.400.** Justification: ECA proposes to include ICAO Doc 8168 Attachment A to Part II, Section 3, Chapter 3 ACAS Training guidelines for Pilots as AMC material.	
response	*Partially accepted*	
	The Agency accepts that reference to appropriate training material should be included in the text. Therefore paragraph AMC.AUR.ACAS.300 ACAS II Training added.	

comment	*137*	comment by: *NATS*
	Article 1 and AUR.ACAS.001 Different wording is used to make the same point regarding scope/applicability. Is this deliberate? AUR.ACAS.100 As currently worded this requirement appears to prevent any upgrades to future versions of ACAS II without a change in the law. Is this deliberate? AUR.ACAS.200 c) Flight crews should be trained on the appropriate version of ACAS II (version 7.1 under this proposal). We suggest there should be an additional bullet 3. requiring training on any changes (e.g. in this case from v7.0 to v7.1	
response	*Not accepted*	
	Reference to the comment with regard to Article 1 and AUR.ACAS.001. The difference is deliberate as it is foreseen to expand the rule to include other	

mandatory requirements associated with airspace. Thus Article 1 is applicable to all the airspace to which the Basic Regulation applies while the scope paragraph of the annexes (i.e. AUR.ACAS.001 in this case) will limit the applicability area as appropriate. Reference to the comment with regard to AUR.ACAS.100. The commentator is correct that the other version will be permitted to be used in the European airspace without a change in the law. This is a deliberate requirement as the Agency considers the use of a fully compatible collision avoidance system to be an important safety issue and wish to ensure that any subsequent versions are fully compatible with the European airspace environment. Reference to the comment with regard to AUR.ACAS.200 (c). This requirement is for flight crew to be appropriately trained and competent in the use of the equipment. Therefore to be in compliance, as version 7.1 is introduced, the necessary training will be required.

comment	*140*	comment by: *DGAC FRANCE*
	AUR. ACAS 100 performance requirement The present wording "could be confusing" especially the word "other aircarft" within the itel c).We understand that even in case the carriage of an ACAS II is not mandatory for your aeroplane , as soon as it is installed aboard, the ACAS II shall own the logic version 7.1 ". ONly turbine-powered aeroplane are concerned. We leave you find out a more appropriate "wording" if you consider that it is necessary	
response	*Accepted*	
	Paragraph AUR.ACAS.100 has been amended as a result of a number of comments in order to clarify the intent.	

comment	*142*	comment by: *Embraer - Indústria Brasileira de Aeronáutica - S.A.*
	Because the TCAS units are not labelled with the CAS software version incorporated, it would be preferable to revise AUR.ACAS.100 to say “ACAS II, which complies with ETSO-C119c, or later version, shall be carried by all turbine-powered aeroplanes ...”	
response	*Not accepted*	
	An ETSO authorisation represents one way (and not the only one) to have parts and appliances approved. This is an optional step which ensures that a part or appliance complies with a minimum performance standard. In all cases, the installer must apply for an installation approval on-board the aircraft. The installer may use the ETSO authorisation as part of the demonstration that the installation complies with the applicable certification basis for the changed aircraft. Therefore as the ETSO authorisation is optional, the Agency will not specify the use of such an authorisation in an implementing rule.	

comment	*149*	comment by: *General Aviation Manufacturers Association (GAMA)*
	Annex 1, Section III, AUR.ACAS.200, (b), 2. (Page 8) – GAMA recommends that EASA clarify that a “clear of conflict” may not always be issued. EASA should include a statement such as “The threat aircraft track or	

	altitude information can be lost during an RA. If so, the RA will terminate without a 'clear of conflict' annunciation." (Reference FAA AC 20-1551A, Appendix A, Section III)
response	*Partially accepted*
	The text has been amended to delete the phrase 'Clear of Conflict is enunciated' and is replaced by 'the conflict is resolved'.

comment	*161*	comment by: *Roland Mallwitz*
	Pg 8, AUR Annex 1, section 3, AUR.ACAS.200 "Use of ACAS", b 2 The paragraph is following Doc 8168, but is not completely in line with the ACAS Manual (ICAO Doc 9863) covering not only most, but all circumstances. "5.2.1.18 When the RA is cleared, the flight crew should: 1) immediately return to their previously assigned clearance and advise ATC of that manoeuvre; or 2) comply with any amended clearance issued."	
response	*Accepted*	
	Text amended to include reference to amended clearance.	

comment	*168*	comment by: *German NSA*
	In Annex 1; Section III. AUR.ACAS.200 (c) ACAS II training programmes shall be established.... comment: It is not explicitely mentioned when the training programm has to be established ! We suggest a timeline of two year´s after the IR will be published, alternative the 1. st of March 2012. SUGGESTION: ACAS II training programmes shall be established until 1 st of March 2012... **AMC 20-15:** 5.2) Hardeware and Installation/ Aural Allerts d) The ACAS II voice announcements..... In ouer view it is not clear, that EASA is responsible to check the compability of the different voice announcements from different warning systems. (?) No Suggestion. 5.6) d) Other interfacing for.... How (by whom) it will decide if it is required ? - no suggestion by NPA 2010-03	
response	*Not accepted*	
	ACAS II training programmes. Not Accepted.	

This requirement is for flight crew to be appropriately trained and competent in the use of the equipment. Therefore to be in compliance, as version 7.1 is introduced, the necessary training will be required. The introduction of a compliance date for this requirement would have a negative effect on the overall safety benefit associated with the introduction of version 7.1 due to the possible misunderstanding of the different aural alerts.

AMC 20-15 Para 5.2. Noted.
In accordance with the scope of the Basic Regulation, EASA is responsible for the design, production, maintenance and operation of aeronautical products, parts and appliances. It therefore considered that the Agency is the appropriate body to undertake such tasks.

AMC 20-15 Para 5.6 Noted.
This requirement has been drafted as a general requirement to permit the installer sufficient freedom to install an ACAS II system that will be applicable to the aircraft environment.

resulting text

See Appendix B for resulting text

II Draft Decision - AMC Part-AUR p. 9

comment 15 comment by: *Royal Aeronautical Society*

Page 9 II Draft Decision – AMC.AUR.ACAS.200 USE OF ACAS II

It is of the utmost importance that all pilots seated at the controls of an aircraft that is equipped with ACAS II should know how to respond correctly to Traffic and Resolution Advisories generated by ACAS and – of equal importance – how to avoid misusing the information it displays and annunciates since this is likely to increase the risk of in-flight collisions. ICAO's training guidelines for the use of ACAS II have been designed for universal application. For this reason, the contents of AMC.AUR.ACAS.200 should:

(a) Either be amended by the insertion of the text of 'Note 3' published in ICAO PANS-OPS Volume I, Part III, Section 3, Chapter 3, amended to read, *'ACAS Training Guidelines for Pilots are provided in Attachment A, "ACAS Training Guidelines for Pilots" and in Attachment B, "ACAS High Vertical Rate Encounters"'*;

(b) Or be replaced by a text that reads, "ACAS II procedures and training should be based upon ICAO *Doc 8168 Procedures for Air Navigation Services – Aircraft Operations (PANS-OPS), Volume I Flight Procedures* (Part III, Section 3, Chapter 3, Operation of ACAS Equipment, and Attachments A (ACAS Training Guidelines for Pilots) and B (ACAS High Vertical Rate Encounters) to that chapter).". (This second option would reduce duplication with Part-OPS amended as described above.)

response *Partially Accepted*

The Agency accepts that reference to appropriate training material should be included in the text. Therefore paragraph AMC.AUR.ACAS.300 ACAS II Training has been added.

	With the introduction of AMC.AUR.ACAS.300, AMC.AUR.ACAS.200 has been deleted. The means of compliance provide in AMC.AUR.ACAS.200 is now included within the documentation referenced in AMC.AUR.ACAS.300

comment	*32*	comment by: *UK CAA*
	Page 9, Paragraph No: AMC.AUR.ACAS.200, Use of Airborne Collision Avoidance System (ACAS) II **Comment:** The word "should" is used throughout the AMC, even in places where the AMC is repeating the rule. This has the effect of the AMC alleviating the rule, which is not permissible. The use of "should" in the AMC should be reviewed, especially where it undermines the proposed rule and creates a disparity with ICAO requirements. **Justification:** Disparity with the proposed rules and ICAO requirements. **Proposed Text:** Replacement of 'should' with 'shall' where appropriate.	
response	*Not accepted*	
	An Acceptable Means of Compliance (AMC) illustrates a means — but not the only means — by which a requirement can be met and an applicant may decide to show compliance by other means. As stated, it is only one means and can therefore not be made mandatory; thus mandatory statements such as 'shall' and 'must' cannot be used.	

comment	*141*	comment by: *DGAC FRANCE*
	• page 9/25 AMC.AUR. ACAS 200 use of ACAS • Do you intend to update the TGL 11 (guidance for operators on training programmes for the use of ACAS), this point is all the more important that both logic versions 7.0 and 7.1 will coexist during at least 2 years	
response	*Noted*	
	JAA TGL 11 will not be updated to an EASA AMC 20 series; the material included in JAA TGL 11 has been included in the proposed new OPS rules.	

comment	*173*	comment by: *FAA*
	Part II, Draft Decision Acceptable Means of Compliance, AMC.AUR.ACAS.200 Use of Airborne Collision Avoidance System (ACAS) II No comments.	
response	*Noted*	
	Thank you for you support. With the introduction of AMC.AUR.ACAS.300, AMC.AUR.ACAS.200 has been deleted. The means of compliance provide in AMC.AUR.ACAS.200 is now included within the documentation referenced in AMC.AUR.ACAS.300	

resulting text	See Appendix C for resulting text.

II Draft Decision - AMC Part-AUR - 1. ACAS II OVERVIEW p. 9

comment	6 ❖	comment by: *AEA*
	Reference text *1.3* *Note 2: The normal operating mode of ACAS II is TA/RA. The TA only mode of operation is used in certain aeroplane performance limiting conditions caused by in-flight failures or as otherwise promulgated by the Competent Authority.* **Comment** This text implies that in normal conditions, TA only mode can be used. Therefore the implementing rule cannot ask for the TA/RA mode to be used permanently. For example AFM: Select TA for: - Dispatch with landing gear down - Engine failure - Operation near closely spaced parallel runway (less than 1 200 ft). **Proposed Change** **AUR.ACAS.200 Use of ACAS II** (a) ACAS II shall be used during flight in a mode that enables Resolution Advisories (RAs) to be produced for the flight crew when undue proximity to another aircraft is detected, **unless the TA only mode of operation is used due to** aeroplane performance limiting conditions caused by in-flight failures or as otherwise promulgated by the Competent Authority.	
response	*Partially accepted*	
	Text amended to include the intent of the comment.	

comment	47	comment by: *Egis Avia*
	There is a typo in the last sentence of para 1.1: "... in the vertical **plain** are predicted ..." should be "... in the vertical **plane** are predicted ..."	
response	*Noted*	
	With the introduction of AMC.AUR.ACAS.300, AMC.AUR.ACAS.200 has been deleted. The means of compliance provide in AMC.AUR.ACAS.200 is now included within the documentation referenced in AMC.AUR.ACAS.300	

comment	56	comment by: *EUROCONTROL - CND/CoE/AT/AO*
	AMC.AUR.ACAS.200. Item 1.1 Typo. Is: plain Should be: plane	

AMC.AUR.ACAS.200. Item 1.1

"…This is achieved through Resolution Advisories (RAs), which propose manoeuvres…"

The word "propose" causes a major concern here. It is different from EASA's own definition of RA (see article 2) where the word "commands" is used. There is a significant difference between "proposing" and "commanding".

It is also different from ICAO definition of RA.
That must be rectified.

response *Noted*

With the introduction of AMC.AUR.ACAS.300, AMC.AUR.ACAS.200 has been deleted. The means of compliance provide in AMC.AUR.ACAS.200 is now included within the documentation referenced in AMC.AUR.ACAS.300 with the changed Article 2 definitions now in accordance with the ICAO definitions, the AMC is considered to be consistent.

comment *84* comment by: *European Cockpit Association*

Comment on II Draft Decision AMC, AMC.AUR.ACAS.200, item 1.2): change as follows:

Delete

Justification: Moved to Annex I, Section III – Operations new item (b).

response *Not accepted*

This paragraph is to provide the general requirement associated with the use of ACAS II in order to introduce the subject to the reader. However it should be noted that with the introduction of AMC.AUR.ACAS.300, AMC.AUR.ACAS.200 has been deleted. The means of compliance provide in AMC.AUR.ACAS.200 is now included within the documentation referenced in AMC.AUR.ACAS.300

comment *85* comment by: *European Cockpit Association*

Comment on II Draft Decision AMC, AMC.AUR.ACAS.200, item 1.3): change as follows:

Delete

Justification: Moved to Annex I, Section III – Operations new item (b).

response *Not accepted*

This paragraph is to provide the general requirement associated with the use of ACAS II in order to introduce the subject to the reader. However it should be noted that with the introduction of AMC.AUR.ACAS.300, AMC.AUR.ACAS.200 has been deleted. The means of compliance provide in AMC.AUR.ACAS.200 is now included within the documentation referenced in AMC.AUR.ACAS.300

comment *86* comment by: *European Cockpit Association*

	Comment on II Draft Decision AMC, AMC.AUR.ACAS.200, item 1.3 Note 1: change as follows: From ~~Note 1:~~ The ability of ACAS II... To **1.2** The ability of ACAS II... Justification: renumber to new item 1.2 if the comment above to delete the old 1.2 is withheld.
response	*Not accepted*
	Comments 84 and 85 have not been accepted. Also note that with the introduction of AMC.AUR.ACAS.300, AMC.AUR.ACAS.200 has been deleted. The means of compliance provide in AMC.AUR.ACAS.200 is now included within the documentation referenced in AMC.AUR.ACAS.300

comment	*87*	comment by: *European Cockpit Association*
	Comment on II Draft Decision AMC, AMC.AUR.ACAS.200, item 1.3 Note 2: change as follows: From ~~Note 2:~~ The normal operating mode... To **1.3** The normal operating mode... Justification: renumber to new item 1.2 if the comment above to delete the old 1.2 is withheld.	
response	*Not accepted*	
	Comments 84 and 85 have not been accepted. Also note that with the introduction of AMC.AUR.ACAS.300, AMC.AUR.ACAS.200 has been deleted. The means of compliance provide in AMC.AUR.ACAS.200 is now included within the documentation referenced in AMC.AUR.ACAS.300.	

comment	*143*	comment by: *Embraer - Indústria Brasileira de Aeronáutica - S.A.*
	AUR.ACAS.200 could be understood that it is not permissible for RAs to be disabled in “normal conditions” but there are some necessary automatic inhibits, due to performance limitations or proximity to ground, as well as some normal operational scenarios where operating TA only is necessary even absent failures (parallel approaches for example). Embraer believes that the intent would be more clearly written as “TA Only selection should only be used to preclude unnecessary RAs when intentionally operating near other aircraft such as to closely spaced parallel runways.”	
response	*Partially accepted*	
	The text has been amended to include the statement ‘unless inhibition of RA mode (using “TA” only or equivalent) is called for by a abnormal procedure or due to performance limiting conditions’.	

resulting text	See Appendix C for resulting text.

II Draft Decision - AMC Part-AUR - 2. USE OF ACAS INDICATORS p. 9-10

comment	17	comment by: *Dassault Aviation*
	<![endif]--> **Conflict between ATC instruction and ACAS order** In reference to § II 2.1(C4) note page 10 The best way to avoid interference between the ATC instructions and the ACAS RA order, is by implementing an automatic muting of ATC audio in case of ACAS RA alert. *Note : This ACAS RA must have precedence on ATC traffic audio, in a similar way than precedence is provided to the stall warning on ACARS RA (II 2.1 C(1) note) .* *ATC audio muting will have permitted to avoid the Uberlingen accident.*	
response	*Not accepted*	
	The inclusion of such a note will imply a particular technical solution in lieu of the operation procedures. Such a method could be proposed and assessed during the certification of a change that introduces ACAS II.	

comment	48	comment by: *Egis Avia*
	There is a slight difference between this paragraph and the ICAO text in PANS-OPS (Doc 8068) where it appears to come from. The ICAO text for item (c) reads "in the event of an RA, flight crew shall" while a "should" has been used in the proposed amendment. The amendment text should conform to the ICAO one and the requirement expressed as a "shall".	
response	*Not accepted*	
	An Acceptable Means of Compliance (AMC) illustrates a means — but not the only means — by which a requirement can be met and an applicant may decide to show compliance by other means. As stated it is only one means and can therefore not be made mandatory; thus mandatory statements such as ‘shall’ and ‘must’ cannot be used.	

comment	58	comment by: *EUROCONTROL - CND/CoE/AT/AO*
	The note under 2.1.c.3 says: “*Manoeuvres or lack of manoeuvres that result in vertical rates opposite to the sense of an RA…”.* It is too limiting. Lack of manoeuvres (not only those that are in the opposite sense) can also result in a mid-air collision. Suggest rephrasing: *Lack of manoeuvres or manoeuvres that result in vertical rates opposite to the sense of an RA…*	
response	*Not accepted*	
	With the introduction of AMC.AUR.ACAS.300, AMC.AUR.ACAS.200 has been deleted. The means of compliance provide in AMC.AUR.ACAS.200 is now included within the documentation referenced in AMC.AUR.ACAS.300	

comment	88	comment by: *European Cockpit Association*

Comment on II Draft Decision AMC, AMC.AUR.ACAS.200, item 2): change as follows:

Delete all main text, including all subparagraphs a) to c)8, except for the accompanying "Notes" :

AMC.AUR.ACAS.300 Use of ACAS Indicators

1. Use of ACAS Indicators

1.1 TAs are intended to alert flight crew to the possibility of an RA, to enhance situational awareness, and to assist in visual acquisition of conflicting traffic.

However, visually acquired traffic may not be the same traffic causing a TA.

Visual perception of an encounter may be misleading, particularly at night.

1.2. The above restriction in the use of TAs is due to the limited bearing accuracy and to the difficulty in interpreting altitude rate from displayed traffic information.

1.3. Stall warning, wind shear, and ground proximity warning system alerts have precedence over ACAS II.

1.4. Visually acquired traffic may not be the same traffic causing an RA. Visual perception of an encounter may be misleading, particularly at night.

1.5. In the case of an ACAS II-ACAS II coordinated encounter, the RAs complement each other in order to reduce the potential for collision.

Manoeuvres or lack of manoeuvres that result in vertical rates opposite to the sense of an RA could result in a collision with the intruder aeroplane.

1.6. Unless informed by the flight crew, ATC may not know when ACAS II issues an RA. It is possible for ATC to issue instructions that are unknowingly contrary to ACAS II RA instructions. Therefore, it is important that ATC be notified when an ATC instruction or clearance is not being followed because it conflicts with an RA.

Justification: Subject to the acceptance of the main proposals regarding the "AUR.ACAS.300 USE OF ACAS INDICATORS", all procedures proper were moved to Annex I, Section III – Operations new item AUR.ACAS.300(d).
It should be noted that the associated "Notes" now constitute the related AMC (appropriately numbered).

response	*Not accepted*

Previous proposals were not accepted.

comment	144	comment by: *Embraer - Indústria Brasileira de Aeronáutica - S.A.*

AUR.ACAS.200(c)1 requires that flight crews be trained "in the avoicance of collisions" but there is not guidance given to describe what type training is required. This training, and associated demonstration of competence, is required for all levels of pilot certificates, so Embraer believes that there is nothing left to be addressed specific to ACAS, other than the system-specific requirements covered in paragraph (c)2. We recommend that paragraph (c)1 be deleted. If this is not acceptable, then it is important that the AMC be augmented to clearly described what is expected by this requirement.

response	*Not accepted*
	Having fight crew that are fully aware of their responsibilities to avoid collisions is fundamental to ensuring safety. Note that the training requirements of AUR.ACAS.200 have deleted and included in the new AUR.ACAS.300

comment	*151*	comment by: *General Aviation Manufacturers Association (GAMA)*
	II Draft Decision Acceptable Means of Compliance AMC.AUR.ACAS.200 Use of Airborne Collision Avoidance System (ACAS) II **Section 2.1c.1-6 (Page 10) –** GAMA recommends the EASA consider harmonizing the language in this proposal with the language in "EUROCONTROL ACAS II Bulletin No. 11 Safety bulletin (March 2010)" to describe flight crew response to an RA.	
response	*Not accepted*	
	The text is consistent with the ICAO text. As the rule will be applicable to all aircraft operating in the airspace, this text is required to be consistent with internationally agreed text. However noted that with the introduction of AMC.AUR.ACAS.300, AMC.AUR.ACAS.200 has been deleted. The means of compliance provide in AMC.AUR.ACAS.200 is now included within the documentation referenced in AMC.AUR.ACAS.300	

comment	*152*	comment by: *General Aviation Manufacturers Association (GAMA)*
	Section 2.1c.5 (Page 10) – GAMA requests that EASA clarify what is meant by "modified RA" through a note.	
response	*Noted*	
	The term 'modified RA' means that the original RA has been changed (modified) as a result of a change in the parameters, e.g. a new threat is observed. This terminology is used within ICAO Annex 10 Volume 4. However noted that with the introduction of AMC.AUR.ACAS.300, AMC.AUR.ACAS.200 has been deleted. The means of compliance provide in AMC.AUR.ACAS.200 is now included within the documentation referenced in AMC.AUR.ACAS.300	

resulting text	See Appendix C for resulting text.

II Draft Decision - AMC Part-AUR - 3. HIGH VERTICAL RATE (HVR) ENCOUNTERS p. 10

comment	*19*	comment by: *Dassault Aviation*
	RVSM operations The idea to limit the climb rate or descent to no more than 1500 ft/mn (paragraph II.3.1 page 10) is not appropriated especially in the context of the future Business Trajectory using optimized continuous descent. Most aircraft are designed to normally operate with descent rate often two times higher that the proposed limit.	

	During descent and climb aircraft air data systems are not in agreement with RVSM performance, which means that ATC must not allow even in RSVM airspace an aircraft to capture a flight level at less than 2000 ft of an other aircraft.
response	*Noted*
	The paragraph, now included within the documentation referenced in AMC.AUR.ACAS.300, is intended to provide a means by which flight crew could reduce the possibility of generating unnecessary RA's due to the ACAS II logic. This requirement will be continually reviewed as the concepts of operation are changed.

comment	*59*	comment by: *EUROCONTROL - CND/CoE/AT/AO*
	The wording of this section differs from the applicable ICAO provisions (PANS-OPS ICAO Doc 8168, part VIII para. 3.3). The best approach might be referring to applicable ICAO provisions rather then providing new wording that may be seen as deviation from ICAO. If the departure from the ICAO text is intentional, then the rational should be given.	
response	*Accepted*	
	With the introduction of AMC.AUR.ACAS.300, AMC.AUR.ACAS.200 has been deleted. The means of compliance provide in AMC.AUR.ACAS.200 is now included within the documentation referenced in AMC.AUR.ACAS.300.	

comment	*89*	comment by: *European Cockpit Association*
	Comment on II Draft Decision AMC, AMC.AUR.ACAS.200, item 3: change as follows: From ~~3.~~ HIGH VETICAL RATE (HVR)ENCOUNTERS ~~3.1~~ Flight crew … To **2.** HIGH VETICAL RATE (HVR)ENCOUNTERS **2.1** Flight crew … Justification: renumber to item 2 and 2.1 under the new AMC.AUR.ACAS.300 if the comment on the new item AMC.AUR.ACAS.300 above is withheld.	
response	*Not accepted*	
	The previous comments have not been accepted.	

comment	*90*	comment by: *European Cockpit Association*
	Comment on II Draft Decision AMC, AMC.AUR.ACAS.200, new item 3: change as follows: **AMC.AUR.ACAS.400 ACAS II TRAINING GUIDELINES FOR PILOTS** **Note._ The acronym _ACAS_ is used in this attachment to indicate**	

ACAS II_.
1. INTRODUCTION
1.1 During the implementation of ACAS and the operational evaluations conducted by States, several operational issues were identified that were attributed to deficiencies in pilot training programmes. To address these deficiencies, a set of performance-based training objectives for ACAS pilot training was developed. The training objectives cover: theory of operation; pre-flight operations; general in-flight operations; response to traffic advisories (TAs); and response to resolution advisories (RAs). The training objectives are further divided into the areas of: ACAS academic training; ACAS manoeuvre training; ACAS initial evaluation; and ACAS recurrent qualification.
1.2 ACAS academic training material has been divided into items that are considered essential training and those that are considered desirable. Those items that are deemed to be essential are a requirement for each ACAS operator. In each area, a list of objectives and acceptable performance criteria is defined. All manoeuvre training is considered essential.
1.3 In developing this material, no attempt was made to define how the training programme should be implemented. Instead, objectives were established that define the knowledge a pilot operating ACAS is expected to possess and the performance expected from a pilot who has completed ACAS training. Therefore, all pilots who operate ACAS equipment should receive the ACAS training described below.
2. ACAS ACADEMIC TRAINING
2.1 General
This training is typically conducted in a classroom environment. The knowledge demonstrations specified in this section may be achieved through the successful completion of written tests or providing correct responses to non-realtime computer-based training (CBT) questions.
2.2 Essential items
2.2.1 Theory of operation. The pilot must demonstrate an understanding of ACAS operation and the criteria used for issuing TAs and RAs. This training should address the following topics:
2.2.1.1 System operation
OBJECTIVE: Demonstrate knowledge of how ACAS functions.
CRITERIA: The pilot must demonstrate an understanding of the following functions:
III-3-3-Att-2 Procedures — Aircraft Operations — Volume I
23/11/06
a) Surveillance:
1) ACAS interrogates other transponder-equipped aircraft within a nominal range of 26 km (14 NM); and
2) ACAS surveillance range can be reduced in geographic areas with a large number of ground interrogators and/or ACAS-equipped aircraft. A minimum surveillance range of 8.5 km (4.5 NM) is guaranteed for ACAS aircraft that are airborne.
Note._ If the operator's ACAS installation provides for the use of the Mode S extended squitter, the normal

surveillance range may be increased beyond the nominal 14 NM. However, this information is not used for collision avoidance purposes.
b) Collision avoidance:
1) TAs can be issued against any transponder-equipped aircraft that responds to the ICAO Mode C interrogations, even if the aircraft does not have altitude-reporting capability;
Note._ SSR transponders having only Mode A capability do not generate TAs. ACAS does not use Mode A interrogations; therefore, the Mode A transponder codes of nearby aircraft are not known to ACAS. In ICAO SARPs, Mode C minus the altitude is not considered Mode A because of the difference in the pulse intervals.
ACAS uses the framing pulses of replies to Mode C interrogations and will track and may display aircraft equipped with an operating Mode A/C transponder whether or not the altitude-reporting function has been enabled.
2) RAs can be issued only against aircraft that are reporting altitude and in the vertical plane only;
3) RAs issued against an ACAS-equipped intruder are coordinated to ensure that complementary RAs are issued;
4) failure to respond to an RA deprives the aircraft of the collision protection provided by its ACAS.
Additionally, in ACAS-ACAS encounters, it also restricts the choices available to the other aircraft's ACAS and thus renders the other aircraft's ACAS less effective than if the first aircraft were not ACAS-equipped;
and
5) manoeuvring in a direction opposite to that indicated by an RA is likely to result in further reduction in separation. This is particularly true in the case of an ACAS-ACAS coordinated encounter.
2.2.1.2 Advisory thresholds
OBJECTIVE: Demonstrate knowledge of the criteria for issuing TAs and RAs.
CRITERIA: The pilot must be able to demonstrate an understanding of the methodology used by ACAS to issue TAs and RAs and the general criteria for the issuance of these advisories to include:
a) ACAS advisories are based on time to closest point of approach (CPA) rather than distance. The time must be short and vertical separation must be small, or projected to be small, before an advisory can be issued. The separation standards provided by air traffic services are different from those against which ACAS issues alerts;
b) thresholds for issuing a TA or RA vary with altitude. The thresholds are larger at higher altitudes;
c) TAs generally occur from 20 to 48 seconds prior to CPA. When ACAS is operated in TA-only mode, RAs will be inhibited;
d) RAs occur from 15 to 35 seconds before the projected CPA; and
e) RAs are chosen to provide the desired vertical separation at CPA. As a result, RAs can instruct a climb or

descent through the intruder aircraft's altitude.
2.2.1.3 ACAS limitations
OBJECTIVE: To verify that the pilot is aware of the limitations of ACAS.
CRITERIA: The pilot must demonstrate a knowledge and understanding of the ACAS limitations including:
a) ACAS will neither track nor display non-transponder-equipped aircraft, nor aircraft with an inoperable transponder, nor aircraft with a Mode A transponder;
b) ACAS will automatically fail if the input from the aircraft's barometric altimeter, radio altimeter, or transponder is lost;
Note._ In some installations, the loss of information from other on-board systems such as an inertial reference system (IRS) or attitude and heading reference system (AHRS) may result in an ACAS failure. Individual operators should ensure that their pilots are aware of what types of aircraft system failures will result in an ACAS failure.
c) some aircraft within 116 m (380 ft) above ground level (AGL) (nominal value) will not be displayed. If ACAS is able to determine that an aircraft below this altitude is airborne, it will be displayed;
d) ACAS may not display all proximate transponder-equipped aircraft in areas of high-density traffic; however, it will still issue RAs as necessary;
e) because of design limitations, the bearing displayed by ACAS is not sufficiently accurate to support the initiation of horizontal manoeuvres based solely on the traffic display;
f) because of design limitations, ACAS will neither display nor give alerts against intruders with a vertical speed in excess of 3 048 m/min (10 000 ft/min). In addition, the design implementation may result in some short-term errors in the tracked vertical speed of an intruder during periods of high vertical acceleration by the intruder; and
g) stall warnings, ground proximity warning system (GPWS)/enhanced ground proximity warning system (EGPWS) warnings, and wind shear warnings take precedence over ACAS advisories. When either a GPWS/EGPWS or wind shear warning is active, ACAS will automatically switch to the TA-only mode of operation except that ACAS aural annunciations will be inhibited. ACAS will remain in TA-only mode for 10 seconds after the GPWS/EGPWS or wind shear warning is removed.
2.2.1.4 ACAS inhibits
OBJECTIVE: To verify that the pilot is aware of the conditions under which certain functions of ACAS are inhibited.
CRITERIA: The pilot must demonstrate a knowledge and understanding of the various ACAS inhibits including:
a) increase descent RAs are inhibited below 442 (_30) m (1 450 (_100) ft) AGL;
b) descend RAs are inhibited below 335 (_30) m (1 100 (_100) ft) AGL;
c) all RAs are inhibited below 305 (_30) m (1 000 (_100) ft) AGL;
d) all ACAS aural annunciations are inhibited below 152 (_30) m (500 (_100) ft) AGL. This includes the aural

annunciation for TAs; and
e) altitude and configuration under which climb and increase climb RAs are inhibited. ACAS can still issue climb and increase climb RAs when operating at the aircraft_s maximum altitude or certified ceiling. However, if aeroplane performance at maximum altitude is not sufficient to enable compliance with the climb rate required by a climb RA, the response should still be in the required sense but not beyond the extent permitted by aeroplane performance limitations.
Note._ In some aircraft types, climb or increase climb RAs are never inhibited.
2.2.2 Operating procedures. The pilot must demonstrate the knowledge required to operate ACAS and interpret the information presented by ACAS. This training should address the following topics:
2.2.2.1 Use of controls
OBJECTIVE: To verify that the pilot can properly operate all ACAS and display controls.
CRITERIA: Demonstrate the proper use of controls including:
a) aircraft configuration required to initiate a self-test;
b) steps required to initiate a self-test;
c) recognizing when the self-test is successful and when it is unsuccessful. When the self-test is unsuccessful, recognizing the reason for the failure, and, if possible, correcting the problem;
d) recommended usage of traffic display range selection. Low ranges are used in the terminal area, and the higher display ranges are used in the en-route environment and in the transition between the terminal and en-route environment;
e) if available, recommended usage of the _Above/Below_ mode selector. _Above_ mode should be used during climb, and _Below_ mode should be used during descent;
f) recognition that the configuration of the traffic display, i.e. range and _Above/Below_ selection, does not affect the ACAS surveillance volume;
g) selection of lower ranges on the traffic display to increase display resolution when an advisory is issued;
h) if available, proper selection of the display of absolute or relative altitude and the limitations of using the absolute display option if a barometric correction is not provided to ACAS; and
i) proper configuration to display the appropriate ACAS information without eliminating the display of other needed information.
Note._ The wide variety of display implementations makes it difficult to establish more definitive criteria. When the training programme is developed, these general criteria should be expanded to cover specific details for an operator_s specific display implementation.
2.2.2.2 Display interpretation
OBJECTIVE: To verify that a pilot understands the meaning of all information that can be displayed by ACAS.
CRITERIA: The pilot must demonstrate the ability to properly interpret information displayed by ACAS

including:
a) other traffic, i.e. traffic within the selected display range that is not proximate traffic, or causing a TA or RA to be issued;
b) proximate traffic, i.e. traffic that is within 11 km (6 NM) and _366 m (1 200 ft);
c) non-altitude reporting traffic;
d) no bearing TAs and RAs;
e) off-scale TAs and RAs. The selected range should be changed to ensure that all available information on the intruder is displayed;
f) traffic advisories. The minimum available display range that allows the traffic to be displayed should be selected to provide the maximum display resolution;
g) resolution advisories (traffic display). The minimum available display range of the traffic display that allows the traffic to be displayed should be selected to provide the maximum display resolution;
h) resolution advisories (RA display). Pilots should demonstrate knowledge of the meaning of the red and green areas or the meaning of pitch or flight path angle cues displayed on the RA display. For displays using red and green areas, pilots should demonstrate knowledge of when the green areas will and will not be displayed. Pilots should also demonstrate an understanding of the RA display limitations, i.e. if a vertical speed tape is used and the range of the tape is less than 762 m/min (2 500 ft/min), how an increase rate RA will be displayed; and
i) if appropriate, awareness that navigation displays oriented _Track-Up_ may require a pilot to make a mental adjustment for drift angle when assessing the bearing of proximate traffic.
Note._ The wide variety of display implementations will require the tailoring of some criteria. When the training programme is developed, these criteria should be expanded to cover details for an operator_s specific display implementation.
2.2.2.3 Use of the TA-only mode
OBJECTIVE: To verify that a pilot understands the appropriate times to select the TA-only mode of operation and the limitations associated with using this mode.
CRITERIA: The pilot must demonstrate the following:
a) knowledge of the operator_s guidance for the use of TA-only mode;
b) reasons for using this mode and situations in which its use may be desirable. These include operating in known close proximity to other aircraft such as when visual approaches are being used to closely spaced parallel runways or taking off towards aircraft operating in a VFR corridor. If TA-only mode is not selected when an airport is conducting simultaneous operations from parallel runways separated by less than 366 m (1 200 ft), and to some intersecting runways, RAs can be expected. If an RA is received in these situations, the response should comply with the operator_s approved procedures; and
c) the TA aural annunciation is inhibited below 152 m (_30) m (500 ft (_100 ft)) AGL. As a result, TAs issued

below 152 m (500 ft) AGL may not be noticed unless the TA display is included in the routine instrument scan.
2.2.2.4 Crew coordination
OBJECTIVE: To verify that pilots adequately brief other crew members on how ACAS advisories will be handled.
CRITERIA: Pilots must demonstrate that their pre-flight briefing addresses the procedures that will be used in responding to TAs and RAs including:
a) division of duties between the pilot flying and the pilot not flying, including a clear definition of whether the pilot flying or the pilot-in-command will fly the aircraft during a response to an RA;
b) expected call-outs;
c) communications with ATC; and
d) conditions under which an RA may not be followed and who will make this decision.
Note 1._ Different operators have different procedures for conducting pre-flight briefings and for responding to ACAS advisories. These factors should be taken into consideration when implementing the training programme.
Note 2._ The operator must specify the conditions under which an RA need not be followed, reflecting advice published by States_ Civil Aviation Authorities. This should not be an item left to the discretion of a crew.
Note 3._ This portion of the training may be combined with other training such as crew resource management (CRM).
2.2.2.5 Reporting requirements
OBJECTIVE: To verify that the pilot is aware of the requirements for reporting RAs to the controller and other authorities.
CRITERIA: The pilot must demonstrate the following:
a) the use of the phraseology contained in the Procedures for Air Navigation Services _ Air Traffic Management (PANS-ATM, Doc 4444); and
b) where information can be obtained regarding the need for making written reports to various States when an RA is issued. Various States have different reporting requirements and the material available to the pilot should be tailored to the airline_s operating environment.
2.3 Desirable items
2.3.1 Advisory thresholds
OBJECTIVE: Demonstrate knowledge of the criteria for issuing TAs and RAs.
CRITERIA: The pilot must be able to demonstrate an understanding of the methodology used by ACAS to issue TAs and RAs and the general criteria for the issuance of these advisories to include:
a) the TA altitude threshold is 259 m (850 ft) below FL 420 and 366 m (1 200 ft) above FL 420;
b) when the vertical separation at CPA is projected to be less than the ACAS-desired separation, an RA requiring a change to the existing vertical speed will be issued. The ACAS-desired separation varies from 91 m (300 ft) at low altitude to a maximum of 213 m (700 ft) above FL 300;

c) when the vertical separation at CPA is projected to be greater than the ACAS-desired separation, an RA that does not require a change to the existing vertical speed will be issued. This separation varies from 183 to 244 m (600 to 800 ft); and

d) RA fixed-range thresholds vary between 0.4 km (0.2 NM) at low altitude and 2 km (1.1 NM) at high altitude.

These fixed-range thresholds are used to issue RAs in encounters with slow closure rates.

3. ACAS MANOEUVRE TRAINING

3.1 When training pilots to properly respond to ACAS-displayed information, TAs and RAs are most effective when accomplished in a flight simulator equipped with an ACAS display and controls similar in appearance and operation to those in the aircraft. If a simulator is utilized, CRM aspects of responding to TAs and RAs should be practised during this training.

3.2 If an operator does not have access to an ACAS-equipped simulator, the initial ACAS evaluation should be conducted by means of an interactive CBT with an ACAS display and controls similar in appearance and operation to those in the aircraft the pilot will fly. This interactive CBT should depict scenarios in which real-time responses must be made. The pilot should be informed whether or not the responses made were correct. If the response was incorrect or inappropriate, the CBT should show what the correct response should be.

3.3 The scenarios in the manoeuvre training should include initial RAs that require a change in vertical speed; initial RAs not requiring a change in vertical speed; maintain rate RAs; altitude crossing RAs; increase rate RAs; RA reversals; weakening RAs; RAs issued while the aircraft is at a maximum altitude, and multi-aircraft encounters. In all scenarios, excursions should be limited to the extent required by the RA. The scenarios should be concluded with a return to the original flight profile. The scenarios should also include demonstrations of the consequences of not responding to RAs, slow or late responses, and manoeuvring opposite to the direction called for by the displayed RA as follows:

3.3.1 TA responses

OBJECTIVE: To verify that the pilot properly interprets and responds to TAs.

CRITERIA: The pilot must demonstrate:

a) proper division of responsibilities between the pilot flying and the pilot not flying. The pilot flying should continue to fly the aeroplane and be prepared to respond to any RA that might follow. The pilot not flying should provide updates on the traffic location shown on the ACAS traffic display and use this information to help visually acquire the intruder;

b) proper interpretation of the displayed information. Visually search for the traffic causing the TA at a location shown on the traffic display. Use should be made of all information shown on the display, note being taken of the bearing and range of the intruder (amber circle), whether it is above or below (data tag), and its vertical

speed direction (trend arrow);
c) other available information is used to assist in visual acquisition. This includes ATC _party-line_ information,
traffic flow in use, etc.;
d) because of the limitations described in 2.2.1.3 e), that no manoeuvres are made based solely on the information
shown on the ACAS display; and
e) when visual acquisition is attained, right of way rules are used to maintain or attain safe separation. No
unnecessary manoeuvres are initiated. The limitations of making manoeuvres based solely on visual acquisition
are understood.
3.3.2 RA responses
OBJECTIVE: To verify THAT the pilot properly interprets and responds to RAs.
CRITERIA: The pilot MUST demonstrate:
a) proper division of responsibilities between the pilot flying and the pilot not flying. The pilot flying should
respond to the RA with positive control inputs, when required, while the pilot not flying is providing updates on
the traffic location, checking the traffic display and monitoring the response to the RA. Proper CRM should be
used. If the operators procedures require the pilot-in-command to fly all RAs, transfer of aircraft control should
be demonstrated;
b) proper interpretation of the displayed information. The pilot recognizes the intruder causing the RA to be issued
(red square on display). The pilot responds appropriately;
c) RAs requiring a change in vertical speed, initiation of a response in the proper direction is made within five
seconds of the RA being displayed. After initiating the manoeuvre, and as soon as possible, as permitted by
flight workload, ATC is notified using the standard phraseology;
Note._ Part III, Chapter 3, 3.2 c) 1), states that in the event of an RA, pilots should respond immediately and
manoeuvre as indicated, unless doing so would jeopardize the safety of the aeroplane.
d) recognition of and the proper response to modifications to the initially displayed RA:
1) for increase rate RAs, the vertical speed is increased within 2 1/2 seconds of the RA being displayed;
2) for RA reversals, the manoeuvre is initiated within 2 1/2 seconds of the RA being displayed;
3) for RA weakenings, the vertical speed is modified to initiate a return towards level flight within 2 1/2
seconds of the RA being displayed; and
4) for RAs that strengthen, the manoeuvre to comply with the revised RA is initiated within 2 1/2 seconds of
the RA being displayed;
e) recognition of altitude crossing encounters and the proper response to these RAs;
f) for RAs that do not require a change in vertical speed, the vertical speed needle or pitch angle remains outside
the red area on the RA display;
g) for maintain rate RAs, the vertical speed is not reduced. Pilots should recognize that a maintain rate RA may

result in crossing through the intruders altitude;
h) that if a justified decision is made to not follow an RA, the resulting vertical rate is not in a direction opposite to
the sense of the displayed RA;
i) that the deviation from the current clearance is minimized by levelling the aircraft when the RA weakens and
when _Clear of Conflict_ is annunciated, executing a prompt return to the current clearance; and notifying ATC
as soon as possible, as permitted by flight crew workload;
j) that when possible, an ATC clearance is complied with while responding to an RA. For example, if the aircraft
can level at the assigned altitude while responding to a reduce climb or reduce descent RA, it should be done;
k) that when simultaneous conflicting instructions to manoeuvre are received from ATC and an RA, the RA is
followed and, as soon as possible, as permitted by flight crew workload, ATC is notified using the standard
phraseology;
l) a knowledge of the ACAS multi-aircraft logic and its limitations, and that ACAS can optimize separation from
two aircraft by climbing or descending towards one of them. For example, ACAS considers as intruders only
aircraft that it finds to be a threat when selecting an RA. As such, it is possible for ACAS to issue an RA against
one intruder, which results in a manoeuvre towards another intruder that is not classified as a threat. If the
second intruder becomes a threat, the RA will be modified to provide separation from that intruder;
m) a knowledge of the consequences of not responding to an RA and manoeuvring in the direction opposite to the
RA; and
n) that a prompt response is made when a climb RA is issued while the aircraft is at the maximum altitude.
4. ACAS INITIAL EVALUATION
4.1 The pilots understanding of the academic training items should be assessed by means of a written test or
interactive CBT that records correct and incorrect responses to questions.
4.2 The pilots understanding of the manoeuvre training items should be assessed in a flight simulator equipped
with an ACAS display and controls similar in appearance and operation to those in the aircraft the pilot will fly, and the results assessed by a qualified instructor, inspector, or check pilot. The range of scenarios should include: initial RAs requiring a change in vertical speed; initial RAs that do not require a change in vertical speed; maintain rate RAs;
altitude crossing RAs; increase rate RAs; RA reversals; weakening RAs; RAs issued while the aircraft is at the
maximum altitude, and multi-aircraft encounters. In all scenarios, excursions should be limited to the extent required by the RA. The scenarios should be concluded with a return to the original flight profile. The scenarios should also include demonstrations of the consequences of not responding to RAs, slow or late responses, and manoeuvring opposite to the direction called for by the displayed RA.
4.3 If an operator does not have access to an ACAS-equipped simulator, the initial ACAS evaluation should be
conducted by means of an interactive CBT with an ACAS display and

**controls similar in appearance and operation to
those in the aircraft the pilot will fly. This interactive CBT should depict scenarios in which real-time responses must
be made, and a record should be made of whether or not each response was correct. The CBT should include all types
of RAs described in 4.2.
5. ACAS RECURRENT TRAINING
5.1 ACAS recurrent training ensures that pilots maintain the appropriate ACAS knowledge and skills. ACAS
recurrent training should be integrated into and/or conducted in conjunction with other established recurrent training programmes. An essential item of recurrent training is the discussion of any significant issues and operational concerns that have been identified by the operator.
5.2 ACAS monitoring programmes periodically publish findings from their analyses of ACAS events. The results
of these analyses typically discuss technical and operational issues related to the use and operation of ACAS. This
information is available from ICAO or directly from the monitoring programmes. ACAS recurrent training
programmes should address the results of monitoring programmes in both the academic and simulator portions of
recurrent training visits.
Note._ ACAS monitoring programmes are carried out by some States and international organizations including the
United States' Federal Aviation Administration (FAA) and the European Organisation for the Safety of Air Navigation
(EUROCONTROL).
5.3 Recurrent training should include both academic and manoeuvre training and address any significant issues
identified by line operating experience, system changes, procedural changes, or unique characteristics such as the
introduction of new aircraft/ display systems or operations in airspace where high numbers of TAs and RAs have been reported.
5.4 Pilots should fly all scenarios once every four years.
5.5 Pilots should complete all scenarios once every two years if CBT is used.**

Justification: insert the requirements from ICAO Doc 8168 Attachment A to Part II, Section 3, Chapter 3 ACAS Training guidelines for Pilots

response *Not accepted*

The intent of this comment is addressed by the introduction of AMC.AUR.ACAS.300 operational procedures and training programmes

comment *138* comment by: *NATS*

AMC.AUR.ACAS.200 3.1

We support the limitation of climb rate when approaching cleared level is but do not accept the caveat that it is only to be done when "the crew are made aware of another aircraft at or approaching an adjacent level or flight level..." . In cases where the crew are not made aware (ATC will not always advise the pilot of adjacent traffic) there may still be an aircraft in such a position so the limited climb rate is still required to prevent nuisance RAs. We consider the

	current wording would have an adverse impact upon operational safety and that the limitation should be effective at all times. We therefore strongly recommend that the words "This should be accomplished when the flight crew are made aware of another aircraft at or approaching an adjacent altitude or flight level, unless otherwise instructed by ATC" be deleted.
response	*Not accepted*
	With the introduction of AMC.AUR.ACAS.300, AMC.AUR.ACAS.200 has been deleted. The means of compliance provide in AMC.AUR.ACAS.200 is now included within the documentation referenced in AMC.AUR.ACAS.300.

resulting text	See Appendix C for resulting text.

III Draft Decision - AMC 20-15 p. 11

comment	*7*	comment by: *Gerhard Gsänger*
	This draft AMC 20-15 seems to focus mainly on new TCAS installations. The majority of affected aircraft however are already equipped with ACAS 2 Change 7.0. In many cases, such upgrades may require only an update of the TCAS processor software. Only a smaller number of aircraft will require a complete new TCAS installation. Guidance for the certification of an simple upgrade of existing ACAS2 installation from 7.0 to 7.1 should be enhanced and clarification added for the boundaries of classification as major or minor change. It should be clarified if existing STC for ACAS 2 7.0 would fulfil the safety objectives of this AMC 20-15 without further substantuation. The current wording of § 6.5 is not sufficient without additional clarification and the limitation to testing aspects should be removed. An enhanced guidance would make it more likely to have a smoth and timely transition to 7.1	
response	*Partially accepted*	
	Paragraph 6.6 added.	

comment	*100*	comment by: *Boeing*
	AMC 20-15: General Comment AMC 20-15 is a result of the introduction of ACAS II software version 7.1. However, there is no clear identification of the requirements which are <u>new</u> due to version 7.1. We recommend specifying those requirements that are new due to version 7.1 (as differentiated from version 7.0). **<u>JUSTIFICATION</u>:** Our recommended change would aid airframers and avionics suppliers in identifying new requirements that need to be met. It also will aid airframers and avionics suppliers in ensuring that all requirements are identified and verified.	

response	*Partially accepted*
	AMC 20-15 has not been developed solely for the introduction of the standard 7.1 software version. It is an acceptable means of compliance that could be used when certifying a new installation. However, the Agency recognises that full adherence to this AMC is not necessarily applicable to upgrades. Therefore to aid the upgrade from version 7.0 to version 7.1 a new paragraph 6.6 has been introduced.

comment	*101*	comment by: *Boeing*
	AMC 20-15: General Comment EASA ETSO-C119c is identified in paragraph 3.1 as the minimum certification standard for ACAS II equipment. ETSO-C119c, paragraph 3.1.1, identifies optional DO-300 Hybrid Surveillance functionality. AMC 20-15 does not address any additional certification requirements for ACAS systems that include this optional functionality. We recommend adding clarifying verbiage to address ACAS units with the optional DO-300 Hybrid Surveillance function. This should include a statement in the Certification Testing section (section 6) that the applicant can (per paragraph 6.5) claim credit for applicable certification and flight test data obtained from equivalent aeroplane installations, including testing performed for TCAS version 6.04A. **JUSTIFICATION:** Our recommendation would clarify the certification requirements for equipment that has the optional Hybrid Surveillance function.	
response	*Partially accepted*	
	Para 6.7 has been added to clarify the requirement.	

comment	*115*	comment by: *AIRBUS*
	General Comment on the AMC 20-15: The optional Hybrid surveillance function is not addressed in the AMC. Airbus suggests to address the point in the AMC in order to avoid future CRI on this topic. (Refer to Airbus comment to §§ 2.2 and 4)	
response	*Partially accepted*	
	Paragraph 6.7 has been added.	

resulting text	For resulting text see Appendix D.

III Draft Decision AMC 20-15 - 2 REFERENCE MATERIAL p. 11

comment	*33*	comment by: *UK CAA*
	Page 11, Paragraph No: AMC 20-15, Para 2-1, EU/EASA	

	Comment: The list of CS references should include CS 27 and CS 29 for rotorcraft as there are some ACAS installations on rotorcraft.
response	*Accepted*
	Applicable CS 27 and CS 29 paragraphs added.

comment	*116*	comment by: *AIRBUS*
	Paragraph 2.2: Optional Hybrid surveillance function should be addressed in the AMC. The following document should be added in the list of reference material: RTCA DO-300, including Change 1, Minimum Operational Performance Standards (MOPS) for Traffic Alert and Collision Avoidance System II (TCAS II) Hybrid surveillance.	
response	*Accepted*	
	Reference to DO-300 added.	

comment	*162*	comment by: *Roland Mallwitz*
	Pg 11, AMC 20-15, Reference material, 2.2 Other documents a) Reference should be made to ED-143 including Change 1 b) It should be considered to reference also ARINC 735B (i.a. communication ACAS ßà transponder, parts compatible to ED-143 resp. DO-185A/B) to overcome incompatible installations	
response	*Partially accepted*	
	a) Accepted; text amended to include change 1. b) Not accepted; ARINC 735B is referenced in ED 143 which is the standard for ACAS II equipment.	

resulting text	See Appendix D for resulting text.

III Draft Decision AMC 20-15 - 3 MINIMUM EQUIPMENT QUALIFICATION p. 11

comment	*34*	comment by: *UK CAA*
	Page 11, Paragraph No: AMC 20-15, Para 3, Minimum Equipment Qualification **Comment:** The proposed AMC 20-15 does not currently identify the minimum equipment standard of ACAS 7.1, noting that the ETSO standard ETSO-C119c does not currently require compliance with ACAS 7.1 either. This should be added/amended. **Justification:** In anticipation of the proposed IR to require ACAS 7.1 being	

	adopted.
response	*Not accepted*
	ETSO-C119c means of compliance is ED-143 including change 1 which is the standard for version 7.1.

comment	*95*	comment by: *Boeing*
	Page: 11 of 25 AMC 20-15 Paragraph: 3.2 We request clarification of the meaning of the parentheses "()" in the reference to “ETSO-2C112().” Does the "()" mean that any revision of ETSO-2C112 is acceptable? Or does it mean to use only the current ETSO revision? **JUSTIFICATION:** No change would be needed if "()" means any revision is acceptable. Otherwise, please list specifically the revision required.	
response	*Noted*	
	The use of parentheses within the context of the AMC means that any revision is an acceptable standard.	

resulting text	See Appendix D for resulting text.

III Draft Decision AMC 20-15 - 4 SAFETY OBJECTIVES p. 12

comment	*13*	comment by: *Eurocopter*
	Attachment #4	
	Although not formally applicable to rotorcraft, the AMC will have to be considered for possible rotorcraft applications. Eurocopter would suggest to reword this section (Draft AMC 20-15 Section 4 Safety Objectives) to avoid possible misinterpretations. A possible rewording is proposed as an attachment.	
response	*Partially accepted*	
	The section 4 of the AMC has been revised to take into account your comments. Also, as a result of the additional comments received, the section has been redrafted to be consistent with the FAA AC 20-151A.	

comment	*20*	comment by: *Dassault Aviation*
	Safety Objectives (paragraph III.4) Technology is more and more involved in "conflict management" and the there is a real need to apply a "1309" approach to define and validated the safety levels of the "conflict management" (separation & collision avoidance). Until such approach will be put in place, safety will remain an illusion. Collision avoidance remains based on "see & avoid" and ACAS is only	

	considered as a safety net. Before to improve the ACAS safety objectives it will be necessary to identify the different failure modes of the "conflict management" and also the common failure modes as the "baro-altitude" or the transponder which are use in the separation and collision avoidance processes.
response	*Noted*
	The agency concurs that ACAS II is a safety net and is not to be used for separation provision. The safety objectives defined in the AMC have been derived to be commensurate with the assessed criticality. Therefore an applicant's system safety assessment should demonstrate compliance with these objectives.

comment	*49*	comment by: *Egis Avia*
	Para 4.3 should include a rationale for the difference in the false alert rates for en-route and TMA environments.	
response	*Not accepted*	
	The document describes the acceptable means of compliance to a requirement. The AMC 20 material is not intended to justify all safety objectives defined in the requirements.	

comment	*71*	comment by: *Rockwell Collins Inc*
	AMC 20-15 Section 4, Safety Objectives 4.3.a) Define "misleading alert". Assume "misleading alert" definition is equivalent to FAA AC20-151A, Appendix E, "Incorrect Resolution Advisory - RA occurring when a threat is present, but, because of a failure of the installed TCAS II, mode S transponder, or associated sensors, commands a maneuver which reduces separation to the threat." 4.3.b) Classify the probability of a system failure as no greater than 1x10-5 per flight hour due to a misleading alert in en route environment. 4.3.c) Classify the probability of a system failure as no greater than 1x10-4 per flight hour due to a misleading alert in terminal environment. 4.3.d) Define "false alert". Assume "false alert" definition is equivalent to FAA AC20-151A, Appendix E, "False Advisory - Advisory caused by a false track or a TCAS II malfunction." 4.3.e) Classify the probability of a system failure as no greater than 1x10-5 per flight hour due to false alerts in en route environment that result in a potential threat with loss of separation against an existing aircraft, which was not a threat prior to issuance of the alert. 4.3.f) Classify the probability of a system failure as no greater than 1x10-4 per flight hour due to false alerts in terminal environment that result in a potential threat with loss of separation against an existing aircraft, which was not a	

threat prior to issuance of the alert.

4.3.g) Classify as Minor (1x10-3) the probability of a system failure due to a false alert which results in an aircraft maneuver which does not result in a potential threat due to a loss of separation against an aircraft in the area.

4.3.h.) Provide guidance on frequencies of potential threat in terminal and en route airspace in order to calculate probability of false and misleading alert.

Assumes frequencies to be equivalent to FAA AC20-151A section 2-20 Testing for Failures System Safety Analysis – "in terminal airspace, the frequency may be assumed to be once every 10 hours and, in en route airspace, it may be once every 200 hours." Assumes these frequencies factor into the calculations for misleading alerts and for false alerts that result in a potential threat from loss of separation for terminal and en route environments.

response *Partially accepted*

The definition for false and misleading alerts has been included. The text has been amended to clarify the intent of the requirement and to provide consistency with the FAA AC 20-151A.

comment *96* comment by: *Boeing*

Page: 12 of 25
AMC 20-15
Paragraph: 4.2

The draft language in paragraph 4.2 is somewhat confusing and could be interpreted differently than what is intended. We recommend revising the text to read as follows:

> *4.2 The probability of failure of the system to provide ~~the required~~* ***Traffic Advisory (TA) and Resolution Advisory (RA)*** *aural ~~and~~* ***or*** *visual ~~alerting functions~~* ***alerts*** *without a failure indication must be shown to be no greater than 1x10-4 per flight hour.*

JUSTIFICATION: Our recommended re-wording clarifies that this requirement applies to TAs and RAs. Additionally, the failure is when EITHER an aural indication OR a visual indication is not provided.

response *Partially accepted*

The text has been amended to clarify the intent of the requirement and to provide consistency with the FAA AC 20-151A.

comment *97* comment by: *Boeing*

Page: 12 of 25
AMC 20-15
Paragraph: 4.3

We request clarification of the definition of the words "false" and "misleading" as used in paragraph 4.3. We understand a "misleading alert" to be when an RA condition exists, an RA is issued, but the RA gives the incorrect guidance.

	We understand a "false alert" to be when an RA is issued, but an RA condition does not exist. To explicitly clarify this, we recommend adding a Note after paragraph 4.3 that would state: ***<u>Note</u>: The definition of a "misleading alert" is when an RA condition exists, an RA is issued, but the RA gives the incorrect guidance. The definition of a "false alert" is when an RA is issued, but an RA condition does not exist.*** **<u>JUSTIFICATION</u>:** Our suggested Note gives clear definitions of "misleading alert" and "false alert."
response	*Accepted*
	Text amended.

comment	*117*	comment by: *AIRBUS*
	Paragraph 4: Optional Hybrid surveillance function should be addressed in the AMC. A note should be added at the end of paragraph 4: "Note: The use of Hybrid surveillance including transitions from acrtive to passive surveillance and vice versa, using a system that complies with the requirements of RTCA DO-300 including Change 1, is assumed not to compromise the safety of TCAS."	
response	*Partially accepted*	
	A paragraph has been added with this text in lieu of a note to paragraph 4.	

comment	*118*	comment by: *AIRBUS*
	Paragraph 4, Safety Objectives: The perimeter of the FHA should be limited to the integration of the equipment to the aircraft.	
response	*Noted*	
	The text of paragraph 4 states: *'The applicant shall perform a Functional Hazard Assessment (FHA) and System Safety Assessment (SSA) to establish the ACAS II criticality and hazards associated with the proposed installation'.* However, it is recognised that in order to demonstrate compliance, reliability data from the equipment manufactures may be necessary.	

comment	*119*	comment by: *AIRBUS*
	Paragraph 4.3: A note should be added at the end of paragraph 4.3 regarding the hypothesis considered for the demonstration of safety objectives in the SSA: "Note: In terminal airspace, the frequency of encounters where another aircraft could present a potential threat may be assumed to be once every 10 hours and, in enroute airspace, it may be once every 200 hours."	

response	*Accepted*
	A note has been added.

comment	*132*	comment by: *Honeywell*
	Regarding AMC 20-15 safety objective 4.2. Does "required aural and visual alerting" include surveillance functionality (transmit and receive)? For example, if the ACAS transmitter fails (undetected) then a potential threat will not be detected and no aural or visual alert will be generated. Is this case intended to be covered. This requirement is not levied in current certification guidance (e.g. AC 20-151A, etc). Demonstration of this safety objective should not be required for the upgrade to change 7.1 of existing certified installations.	
response	*Partially accepted*	
	The text of paragraph 4 has been amended to clarify the definition of the ACAS II system to read 'For the purposes of this AMC, system includes all airborne devices contributing to the ACAS II function'. With respect to upgrades from version 7.0 to 7.1, a new paragraph 6.6 has been introduced to clarify the upgrade requirements.	

comment	*153*	comment by: *General Aviation Manufacturers Association (GAMA)*
	III Draft Decision AMC 20-15 **AMC 20-15: Airworthiness Certification Considerations for the Airborne Collision Avoidance System (ACAS II)** **Section 4.3 (page 12) –** GAMA requests that the EASA define the term "false alert". GAMA suggests the following definition "False Advisory – Advisory caused by a false track or a ACAS II malfunction" (FAA AC 20-151A, Appendix E) **Section 4.3 (page 12) –** GAMA requests that the EASA define the term "misleading alert". GAMA suggests the following definition "Incorrect Resolution Advisory – RA occurring when a threat is present, but, because of a failure of the installed ACAS II, mode S transponder, or associated sensors, commands a maneuver which reduces separation to the threat." (FAA AC 20-151A, Appendix E) **Section 4.3 (page 12) –** GAMA requests the EASA provide guidance on the frequencies of potential threats in terminal and enroute airspace in order to calculate the probability of false and misleading alerts. GAMA recommends the EASA include a statement to the effect "in terminal airspace, the frequency may be assumed to be once every 10 hours and, in en route airspace, it may be once every 200 hours." (FAA AC 20-151A Section 2-20) **Section 4.3 (page 12) –** GAMA recommends the EASA classify the probability of a system failure as no greater than $1x10^{-5}$ per flight hour due to a misleading alert in the en route environment. **Section 4.3(page 12) –** GAMA recommends the EASA classify the probability of a system failure as no greater than $1x10^{-4}$ per flight hour due to a misleading alert in the terminal environment.	

Section 4.3 (page 12) – GAMA recommends the EASA classify the probability of a system failure as no greater than $1x10^{-5}$ per flight hour due to false alerts in the en route environment that result in a potential threat with loss of separation against an existing aircraft, which was not threat prior to the issuance of the alert.

Section 4.3 (page 12) – GAMA recommends the EASA classify the probability of a system failure as no greater than $1x10^{-4}$ per flight hour due to false alerts in the terminal environment that result in a potential threat with loss of separation against an existing aircraft, which was not threat prior to the issuance of the alert.

Section 4.3 (page 12) – GAMA recommends the EASA classify the probability of a system failure due to a false alert which results in an aircraft maneuver which does not result in a potential threat due to a loss of separation against an aircraft in the area as Minor ($1x10-^{3}$).

response *Partially accepted*

A definition for false and misleading RA alerts has been incorporated.

The text has been amended to clarify the intent of the requirement and to provide consistency with the FAA AC 20-151A.

comment *174* comment by: *FAA*

Section 4 Safety objectives
Modify 4.2 as follows: Unannunciated failures of the TCAS II equipment, its associated transponder, or sensors or displays that could generate an incorrect resolution advisory, must be improbable.~~The probability of failure of the system to provide the required aural and visual alerting functions without a failure indication must be shown to be no greater than 1x10-4 per flight hour.~~

comment: Harmonises with FAA AC 20-151A
Modify 4.3 as follows: The probability of false or misleading alerts due to a failure of the system when no collision threat exists must be shown to be no greater than 1x10-4 per flight hour in the terminal environment and 1x10-5 per flight hour in the enroute environment. **The frequency of encounters where another aircraft could present a potential threat depends on the density of aircraft in the airspace. In terminal airspace, the frequency may be assumed to be once every 10 hours and, in enroute airspace, it may be once every 200 hours.**

comment: Harmonises with FAA AC 20-151A

response *Partially accepted*

The text has been amended to clarify the intent of the requirement and to provide consistency with the FAA AC 20-151A; however it should be noted that the Agency's probability definitions differ from those of the FAA.

resulting text See Appendix D for resulting text.

III Draft Decision AMC 20-15 - 5 HARDWARE AND INSTALLATION p. 12-14

comment	*60*	comment by: *EUROCONTROL - CND/CoE/AT/AO*
	AMC 20-15. Item 5.6. (b) "An interface to a radio altimeter sensor should be provided" That is incorrect. An interface to a radio altimeter sensor must be provided – radio altimeter is a required component of ACAS (refer to ED143)	
response	*Not accepted*	
	An Acceptable Means of Compliance (AMC) illustrates a means — but not the only means — by which a requirement can be met and an applicant may decide to show compliance by other means. As stated it is only one means and can therefore not be made mandatory; thus mandatory statements such 'shall' and 'must' cannot be used.	

comment	*72*	comment by: *Rockwell Collins Inc*
	Section 5, Hardware and Installation 5.3.d) Specify that a Primary Flight Display (PFD) with a lighted red command (vertical speed arc, vertical speed tape, or pitch cue) is also acceptable.	
response	*Accepted*	
	Text amended.	

comment	*73*	comment by: *Rockwell Collins Inc*
	5.6.f) Clarify what exactly is the "RA discrete" Assume this refers to the RA Guidelines of Data Word 270 Discrete Outputs (all 12 bits) as defined in ARINC 735B.	
response	*Partially accepted*	
	Text amended to refer to ED-112.	

comment	*98*	comment by: *Boeing*
	Page: 14 of 25 AMC 20-15 Paragraph: 5.6 (f) The proposed text states that the "ACAS vertical data word" must be recorded by the flight recorder. However, it is unclear what this parameter is. A review of "TABLE II-A.1: PARAMETERS TO BE RECORDED – AEROPLANES" of the flight recorder MOPS (EUROCAE ED-112) does not specify or explain "ACAS vertical data word." We recommend adding a clear definition of "ACAS vertical data word" to the proposed AMC.	

	JUSTIFICATION: A clear definition of "ACAS vertical data word" is required so that the correct data parameter can be recorded.
response	*Partially accepted*
	Text amended to refer to ED-112.

comment	*145*	comment by: *Embraer - Indústria Brasileira de Aeronáutica - S.A.*
	Paragraph 5.3(h) on page 13 implies that any system failure that can result in lack of Ra availability must be detected and annunciated, where paragraph 4.2 has a specific allowance for those failures. Since Paragraph 4.2 adequately addresses both the failure and annunciation requirement Embraer believes that paragraph 5.3(h) should be deleted, or alternatively rewritten to say "An indication of detected ACAS II system and sensor failures which prevent ResolutionAdvisories should be provided." Literal compliance with paragraph 5.3(i) will result in a "TA Only" annunciation twice a flight (takeoff and landing while below the RA inhibit floor) and possibly for extended periods in cruise if the airplane is flying where there is inadequate RA performance margins. Embraer believes it would be preferable to write this requirement as "An indication that the ACAS II system is manually selected ~~operating~~ in the TA mode only should be provided."	
response	*Not accepted*	
	The requirements specified in paragraph 4.2 and 5.3(h) are complementary. ACAS II should provide annunciation of system and sensor failures; however the allowable failure rate of this annunciation is defined. With respect to paragraph 5.3 (i), the crew should be made aware of when ACAS II is in TA mode. For 'take off' and 'landing' the display of ACAS II 'mode' should indicate TA, thus no change to paragraph 5.3 (i) is required.	

comment	*146*	comment by: *Embraer - Indústria Brasileira de Aeronáutica - S.A.*
	Paragraph 5.6(f), which requires a ACAS vertical data word to be recorded on the DFDR, is a mandatory requirement and should be included as part of AUR.ACAS.100, or the tables in the applicable appendices of EU OPS should be revised to include this new parameter. It would also clarify the requirement if reference were made to the appropriate ARINC specification that describes the data word.	
response	*Partially accepted*	
	Text amended to refer to ED-112.	

comment	*154*	comment by: *General Aviation Manufacturers Association (GAMA)*
	Section 5.3, (d) (page 13) – GAMA recommends the EASA clarify that a Primary Flight Display (PFD) with a lighted red command (vertical speed arc, vertical speed tape, or pitch cue) is also acceptable.	
response	*Accepted*	
	Text amended.	

comment	155	comment by: *General Aviation Manufacturers Association (GAMA)*
	Section 5.6, (f) (page 14) – GAMA requests that the EASA clarify the term "RA discrete" as defined in ARINC 735B in the RA Guidelines of Data Word 270 Discrete Outputs (all 12 bits).	
response	*Partially accepted*	
	Text amended to refer to ED-112.	

comment	163	comment by: *Roland Mallwitz*
	Pg 13, AMC 20-15, 5.3 Displays & indications Based on the experience from the Brazilian mid-air collision an additional item should be added, which could be s.th. like *"The flight crew must be made aware of any change in the operational state of the ACAS".*	
response	*Accepted*	
	Paragraph 5.3 (l) added.	

comment	164	comment by: *Roland Mallwitz*
	Pg 13, AMC 20-15, 5.5 Antennas, a) A note added to 5.5.a would be beneficial indicating that, although a true omni-directional antenna may be used at the bottom, it would be beneficial to install two directional antennas, with the one at the bottom having an omni-directional characteristic. This reduces multipath and ensures consistent performance.	
response	*Partially accepted*	
	A note has been added regarding the location of the Omni-directional antenna. The Agency is of the opinion that introducing the concept to use directional antennas with omni-directional characteristics may lead to confusion and to incorrect use of two omni-directional antennas.	

comment	165	comment by: *Roland Mallwitz*
	Pg 14, AMC 20-15, 5.6 Interfaces Note 1 to 5.6.a should be stronger as ICAO Annex 10 is going to eliminate Gray encoders at least for new aircraft. Alternatively, an additional appropriate statement could be introduced in 5.6.	
response	*Accepted*	
	Text amended to reflect that Gillham code should not be used.	

comment	175	comment by: *FAA*
	Section 5 Hardware and Installation Section 5.2 Aural Alerts	

Modify 5.2 (a) as follows: TA and RA aural alerts will need to be presented by the prescribed voice announcements via ~~loudspeakers~~ *flight deck speakers*.
Modify 5.2 (b) as follows: Consideration should be given to presenting *ACAS* voice announcements via headsets at a preset level, ~~particularly where active noisereducing headsets are used~~.

Modify 5.2(d) as follows: The ACAS II voice announcements should be consistent with the general philosophy of other flight deck aural alerting systems. In particular, the prioritisation and compatibility of alerts and voice announcements from
different warning systems should be consistent with each other. Altitude callout advisories which occur simultaneously with ACAS II ~~cautions and warnings~~ *advisories* are permitted, but the audibility of each voice alert will need to be understandable. *Also, verify that windshear or GPWS/TAWS warnings can be clearly understood and that ACAS II is automatically switched to the TA Only mode when ACAS II and windshear voice or GPWS/TAWS announcements simultaneously occur. The alert priorities should be windshear, GPWS/TAWS and then ACAS II.*

Section 5.3 Displays and Annunciations

Modify 5.3 (c) as follows: Resolution Advisory guidance must be presented *at each pilot station* in the pilot's primary field of view. Resolution Advisories may be presented on EFIS or IVSI displays provided their primary functions are not compromised.

Modify 5.3 (d) as follows: ~~A discrete red warning Resolution Advisory enunciator must be located in each pilot's primary field of view. An Instantaneous Vertical Speed Indicator (IVSI) with a lighted red arc or an electronic attitude display with an alphanumeric message may be acceptable instead of a discrete warning enunciator.~~

A discrete red warning annunciator that indicates the presence of a TCAS II RA is optional. This red warning must be located in each pilot's primary field of view and be inhibited below 900 feet AGL. An IVSI with a lighted red arc or an alphanumeric message on the electronic attitude display indicator (EADI) is acceptable instead of this discrete warning annunciator.

Section 5.4 ACAS II Controls
Section 5.5 Antennas

Add new 5.5(c) as follows: *The maximum height of the directional antenna is expected to be approximately 1 inch, and therefore is not considered susceptible to icing effects in the general area of the proposed installation. Otherwise, consider anti-icing provisions.*

Section 5.6 Interfaces

Modify 5.6 (a) Note 2 as follows:
Note 2: Where a databus or a synchro source is not available, an acceptable alternative is two independent altitude encoders supplying altitude information in ICAO Gray (Gillham) format together with a comparator capable of detecting and responding to encoder

Comment [SSP3]:
Optional in AC 201-51A.

	Alternate wording extracted from Ac 201-51A and modified slightly is recommended. **Comment [SSP4]:** The Controls listed in Section 5.4 are not a complete list of controls. Refer to AC 20-151A. malfunctions. *All transponder altitude comparator failures must be annunciated.* A resolution of 100ft is provided by an ICAO Gray (Gillham) format encoder as used for transponder altitude reporting. The ICAO Gray (Gillham) altitude encoding format is defined in the appendix to Chapter 3 of ICAO Annex 10, Volume IV. *Add new section 5.7 as follows* *5.7 ICAO 24 Bit address* Add new 5.7 (a) to read as follows: *(a) An ICAO 24 bit airframe address will need to be assigned by the responsible authority in the state of registration and will need to be implemented in the aircraft.* Add new 5.7 Note 1 to read as follows: *Note 1: The ICAO 24-bit aircraft address is a uniquely assigned aircraft identification that also identifies the country of registration. There have been occurrences where two airplanes report identical ICAO 24-bit aircraft addresses. This problem can be caused when a change in registration numbers occurs. When an airplane's registration number is changed, the operator should verify that the ICAO 24-bit aircraft address and the new registration number have a one-to-one correspondence.* Add new 5.8 as follows: *5.8 Equipment Compatibility Requirements. Make an evaluation to show that the ACAS II system communicates with other approved ACAS II systems made by other manufacturers. Submit evidence to show that you performed ACAS/transponder interoperability bench tests using the same ACAS/transponder pairing (the same part numbers) as the installation seeking certification. Specific guidance can be found in FAA Advisory Circular AC 20-151A, Airworthiness Approval of Traffic Alert and Collision Avoidance Systems (TCAS II) and Mode S Transponders.*
response	*Partially accepted*
	Para 5.2(a) –Partially accepted; the term flight deck introduced. Para 5.2(d) – Accepted; text amended. Para 5.3(c) – Accepted; text amended. Para 5.3(d) – Partially accepted; text amended to clarify the intent that a discrete is optional. Para 5.5(c) Not accepted; this should be taken into consideration by the Design Organisation. Para 5.6(a) – Not accepted; this paragraph has been amended as a result from other comments. SSP3 – The Agency does not understand this comment.

	SSP4 – Not accepted; the requirement is to ensure that controls are ready accessible and it is not the intent of the Agency to list all possible control combinations. The use of Gillham code has been removed from the proposed AMC. Addition of paragraph 5.7 – Not accepted; this requirement is addressed in the JAA TGL-13 rev 1 applicable to Mode S installations. Addition paragraph 5.8 – Not accepted. This is considered part of the compliance demonstration to MOPS. Para 3.1 requires the installation of equipment certified in accordance with the MOPS.
resulting text	For resulting text see Appendix D.

III Draft Decision AMC 20-15 - 6 CERTIFICATION TESTING p. 14-15

comment	*9*	comment by: *Lufthansa/Lauterbach*
	To help a seamless introduction into service of the ACAS II Version 7.1 we suggests to implement a "coordination and implementation group" (like the Eurocontrol AICG - ACAS Implementation & Coordination Group for the introduction of ACAS II)	
response	*Noted*	
	The Agency considers that an implementation and coordination group is not required for an upgrade program and that operators will have a legal obligation to comply.	

comment	*35*	comment by: *UK CAA*
	Page 14, Paragraph No: AMC 20-15, Para 5.6 (a) Notes 1 and 2 **Comment:** This paragraph still allows use of Gray (Gillham) parallel altitude databus interface. Consideration should be given to precluding its use in new ACAS installations. **Justification:** To prevent the potential failure mode – especially if EASA AD 2006-0625 is amended or deleted.	
response	*Accepted*	
	This paragraph has been reworded to exclude the use of Gillham code.	

comment	*36*	comment by: *UK CAA*
	Page 15, Paragraph No: AMC 20-15, Para 6.5 **Comment:** It is suggested that there should be some guidance on certification testing required for upgrades to ACAS 7.1 for existing installations. **Justification:** Current text only addresses updates from 6.04 A standard.	
response	*Accepted*	
	A new paragraph 6.6 has been introduced to address the upgrade requirements from 7.0 to 7.1.	

comment	*91*	comment by: *Rockwell Collins Inc*
	Section 6, Certification Testing	

	6) Recommend specifying ground azimuth tests similar to that of AC20-151A, Section 3-3a. 6.3) Clarify "surveillance range" to be "surveillance range in applicable environment" or "surveillance range reasonableness". Surveillance range can vary given airspace conditions. Interference Limiting will reduce surveillance range given the RF power reduction based on the number of TCAS equipped aircraft in the area. Leaving the wording as "surveillance range" creates an expectation of a fixed value.
response	*Accepted*
	Paragraph 6.3 has been amended to include a note to explain that surveillance range may vary depending on airspace conditions.

comment	*99*	comment by: *Boeing*
	Page: 15 of 25 AMC 20-15 Paragraph: 6.5 Paragraph 6.5 implies that the Certification Tests required in paragraphs 6.1, 6.2, 6.3, and 6.4 can be satisfied by the certification and flight test data from equivalent aeroplane installations. We recommend revising the entire text of paragraph 6.5 as follows to make it more explicit and clear: ***6.5 The certification requirements of paragraphs 6.1, 6.2, 6.3, and 6.4 can be met by using certification and flight test data from equivalent aeroplane installations.*** **JUSTIFICATION:** Our recommendation would more clearly define what is required for follow-on installations.	
response	*Partially accepted*	
	Paragraph 6.5 has been amended as a result of other comments to clarify the intent.	

comment	*120*	comment by: *AIRBUS*
	Paragraph 6.5: Paragraph 6.5 refers to testing performed for TCAS version 6.04A. The reference to TCAS version 6.04 should be replaced by a reference to TCAS version 7.0 since the AMC (replacing TGL 8) shall also identify the advantage that can be taken from TCAS version 7.0.	
response	*Accepted*	
	Reference to version 7.0 has been added.	

comment	*156*	comment by: *General Aviation Manufacturers Association (GAMA)*
	Section 6. (page 14) – GAMA recommends the EASA specify ground azimuth	

	tests similar to that of called out in FAA AC 20-151A, section 3-3a.
response	*Accepted*
	Paragraph 6.2 has been updated to include a bearing accuracy check.

comment	*157*	comment by: *General Aviation Manufacturers Association (GAMA)*
	Section 6.3 (page 14) – GAMA recommends the EASA use the words "surveillance range in applicable environment" or surveillance range reasonableness" rather than "surveillance range". Surveillance range can vary with airspace conditions. Interference will reduce surveillance range given thr RF power reduction based on the number of ACAS equipped aircraft in the area. The term "surveillance range" creates a false expectation of a fixed value.	
response	*Accepted*	
	Paragraph 6.3 now includes a note to explain that surveillance range may vary depending on airspace conditions.	

comment	*158*	comment by: *General Aviation Manufacturers Association (GAMA)*
	Section 6.5 (page 15) – GAMA recommends that the EASA include TCAS version 7.0 as a comparable method of demonstration: "To minimize the certification effort for ACAS II follow-on installations, the applicant may claim credit, for applicable certification and flight test data obtained from equivalent aeroplane installations, including testing performed for TCAS versions 6.04 and 7.0. Flight testing of ACAS II will not formally be required where acceptable evidence exists relating to the previous certification standard of TCAS. This assumes introduction of ACAS II involves equipment replacements only."	
response	*Accepted*	
	Reference to version 7.0 has been added to the text.	

comment	*170*	comment by: *IFATCA*
	Note: Aeroplane malfunctions which would prevent the aeroplane from following ACAS II climb ~~commands~~, and which do not automatically inhibit the ACAS II climb ~~commands~~, should be addressed (e.g. as a cautionary note) in the AFM/POH. Justification Replace with indication Reason: ACAS does not consider all threats to the aircraft, for example stall warning, wind shear and ground proximity warning system alerts have precedence. (NPA page 10 Note 1). The ACAS procedures (see below)[1] use the term "unless", which also indicates that it is certainly not a command. The term command is therefore too strong. The term "ACAS Indicator" is used as the section title in NPA page 9 section 2. The term indicators or indications should therefore be used instead of commands. [1] AUR ACAS 200: B) 1. The pilot flying shall immediately take the corrective action indicated by the RA, even if this conflicts with an Air Traffic Control	

	(ATC) instruction, unless doing so would jeopardise the safety of the aeroplane
response	*Accepted*
	Text amended.

comment	*176*	comment by: *FAA*

Section 6 Certification Testing
Add new 6.2(a) as follows:
(a) Verify that the air/ground inputs are connected properly.

Add new 6.2(a) Note 1 as follows:

Comment [SSP5]:
Due to the lack of specificity defined in section 6, this material is inadequate to ensure that the design and installation performs its intended function under the expected operating conditions, and that there are no adverse interactions between the TCAS II Mode S transponder and existing aircraft systems.
Consequently addition of a new 6.6 is proposed.

Note 1: When the aircraft is on the ground, the Mode S transponder must be inhibited from replying to any Mode A, Mode C, Mode A/C/S all-call interrogations and Mode S-only all-call interrogations.

Add new 6.2(a) Note 2 as follows:
Note 2: This inhibit is usually accomplished via an appropriate transponder pin connected through the weight-on-wheels switch, but it might also be accomplished through some other automatic means (for example, velocity/altitude algorithm, etc.). The inhibit means must be verified during ground testing. Note 3: While on the ground, the transponder normally should stop output of acquisition squitters (short squits), and should continue output of extended squitters (known as long squits or ADS-B) in the surface format, and it should reply to any discretelyaddressed aircraft interrogations. This too should be verified during ground testing. The exact conditions for transmission of acquisition squitter are specified in DO-181D section paragraph 2.2.18.2.6, Acquisition Squitter Protocols.

Add new 6.2(b) as follows: *(b) Evaluate the general arrangement and operation of controls, displays, circuit breakers, annunciators, and placards of the TCAS II system. Conduct a human factors evaluation of the controls, displays and annunciators. Evaluate the ACAS controls and the controls of installed systems that interact with TCAS (for example, transponders) to determine that they are designed and located to prevent inadvertent actuation. Evaluate ACAS displays and annunciations to determine that they support flight crew awareness of ACAS status changes which could result from ACAS mode selections, intentional pilot actuation of other installed systems, or inadvertent pilot actions with ACAS or other installed systems. Evaluate ACAS displays to ensure all information is, at a minimum, legible, unambiguous, and attention-getting (as applicable). In particular, where transponder functions are integrated with other system controls, ensure that unintended transponder mode switching, especially switching to STANDBY or OFF, is not possible. Pay close attention to line select keys, touch screens or cursor controlled trackballs as these can be susceptible to unintended mode selection resulting from their location in the flight deck (for example proximity to a foot rest or adjacent to a temporary stowage area).*

	Add new 6.6 as follows: *6.6 More specific guidance material for ACAS II certification and testing can be found in FAA Advisory Circular AC 20-151A, Airworthiness Approval of Traffic Alert and Collision Avoidance Systems (TCAS II) and Mode S Transponders.*
response	*Not accepted*
	Proposed Note 1 and Note 2 not accepted; this should be tested during the Mode S Transponder certification testing. New paragraph 6.2(b) not accepted; the existing paragraph 6.3 requires the applicant to evaluate the overall operation of the ACAS II system which includes general arrangement and operation, etc.; also the new paragraph 5.3.(l) has been added to ensure that crew are aware, at all times, of the operational state of the ACAS II system. New paragraph 6.6 not accepted; reference to AC 20-151A not required as paragraph 6.2 (Ground Testing) and paragraph 6.3 (Flight Testing) are expanded to provide more specific guidance.

resulting text	See Appendix D for resulting text.

III Draft Decision AMC 20-15 - 7 MAINTENANCE p. 15

comment	*92*	comment by: *Rockwell Collins Inc*
	Section 7, Maintenance 7.2) Add a note indicating that a ground based ramp test monitoring targets of opportunity in the airspace is acceptable. Appendix 1, bullet 3, implies that a ramp tester is discouraged and should be avoided except under special circumstances.	
response	*Partially accepted*	
	The use of targets of opportunity is not accepted as a method to verify the correct operation of a directional antenna, as no correlation can be guaranteed between the observed aircraft and that displayed on ACAS II. With respect to Appendix bullet 3 comment, it is accepted. This bullet point has been deleted to be in accordance with the transponder testing guidance given in EUROCAE ED-73C.	

comment	*159*	comment by: *General Aviation Manufacturers Association (GAMA)*
	Section 7.2 (page 15) – GAMA recommends that a note be added to indicate that ground based ramp testing to monitor targets of opportunity in the airspace is acceptable. Appendix 1, bullet 3 implies that ramp testing is discouraged and should be avoided except under special circumstances.	
response	*Partially accepted*	

	The use of targets of opportunity is not accepted as a method to verify the correct operation of a directional antenna, as no correlation can be guaranteed between the observed aircraft and that displayed on ACAS II. With respect to Appendix bullet 3 comment, it is accepted. This bullet point has been deleted to be in accordance with the transponder testing guidance given in EUROCAE ED-73C.
resulting text	See Appendix D for resulting text.

III Draft Decision AMC 20-15 - 8 AFM/PILOT OPERATING HANDBOOK p. 15

comment	*5*	comment by: *AEA*
	Reference Text *8.3 Normal Procedures Section: The ACAS II flight procedures should address the following:* *(d) Advice that evasive manoeuvring should be made with the autopilot and autothrottle disengaged, and limited to the minimum required to comply with the RA.* **Comment** This is not necessarly the case, for example, currently the Aircraft Flight Manual for certain types (B757, B767) specifically states that an RA should be followed with autothrottle ENGAGED. **Proposed Changes** Delete	
response	*Accepted*	
	Reference to the autopilot and autothrottle disengagement has been deleted.	

comment	*61*	comment by: *EUROCONTROL - CND/CoE/AT/AO*
	Item 8.3. (b) It is unclear why (b) talks only about “crossing RAs”. Noncompliance with an RA (crossing or non-crossing) by one airplane will almost always result in reduced vertical separation. So, the scope of this note should not be limited to crossing RAs. Moreover, the note invites the pilots to seek separation by visual means at the time of the RA which is not always desirable and in certain cases may jeopardize collision avoidance advice issued by TCAS. The purpose and rational for this note should be reviewed and text amended accordingly. **Item 8.3. (d)** This item does not take into account the existence of the Airbus implementation of AP/FD (which will automatically respond to RAs with	

	autopilot and autothrottle engaged).
response	*Accepted*
	Text amended accordingly.

comment	*121*	comment by: *AIRBUS*
	Paragraph 8.3 (d): A note should be added under paragrpah 8.3 (d) explaining that the advice is valid only in the case the A/C is not equipped with an autopilot function supporting ACAS RA for evasive manoeuvres.	
response	*Partially accepted*	
	The advice given in the AFM/Pilot operating handbook should be consistent with the method of operation. However, to permit autopilot functions, the reference to the use of the autopilot has been deleted from the paragraph.	

comment	*171*	comment by: *IFATCA*
	(c) A caution that under certain conditions, ~~commanded~~ manoeuvres may significantly reduce stall margins with the need to respect the stall warnings. Justification Replace by indicated reason: ACAS does not consider all threats to the aircraft, for example stall warning, wind shear and ground proximity warning system alerts have precedence. (NPA page 10 Note 1). The ACAS procedures (see below)[1] use the term “unless”, which also indicates that it is certainly not a command. The term command is therefore too strong. The term “ACAS Indicator” is used as the section title in NPA page 9 section 2. The term indicators or indications should therefore be used instead of commands. [1] AUR ACAS 200: B) 1. The pilot flying shall immediately take the corrective action indicated by the RA, even if this conflicts with an Air Traffic Control (ATC) instruction, unless doing so would jeopardise the safety of the aeroplane	
response	*Accepted*	
	Text amended.	

resulting text	See Appendix D for resulting text.

III Draft Decision AMC 20-15 - 10 AVAILABILITY OF DOCUMENTS p. 16

comment	*177*	comment by: *FAA*
	Section 10 Availability of Documents For RTCA and FAA documents, add new text as follows: *Copies of RTCA documents may be obtained from RTCA Inc., 1140 Connecticut Avenue, N.W., Suite 1020, Washington, DC 20036-4001, USA, (Tel: 1 202 833*	

	9339) Web site: www.rtca.org. *Copies of FAA documents may be obtained from Superintendent of Documents, Government Printing Office, Washington, DC 20402-9325, USA.*
response	*Accepted*
	RTCA and FAA contact details added.

resulting text	See Appendix D for resulting text

III Draft Decision AMC 20-15 - Appendix 1 - ACAS II / Mode S Transponder Ground Testing Precautions p. 17

comment	*37*	comment by: *UK CAA*
	Page 17, Paragraph No: AMC 20-15 Appendix 1 **Comment:** We welcome the addition of Appendix 1.	
response	*Noted*	
	The Agency thanks you for your continued support.	

comment	*62*	comment by: *EUROCONTROL - CND/CoE/AT/AO*
	2nd bullet. We question the usefulness and practicality of this advice. It is unclear, and not covered in any ATM regulations, what ATC is required to do with such information and how they would need to handle such test targets on the screen. Moreover, the proposed procedure it will not prevent unwanted RAs. All testing should be done in the manner that any transmission of altitude information is prevented. **5th bullet.** We question the usefulness and practicality of this advice. It is unclear, and not covered in any ATM regulations, what ATC is required to do with such information and how they would need to handle such test targets on the screen. All testing should be done in the manner that any transmission of altitude information is prevented.	
response	*Noted*	
	These precautions are in accordance with those specified in EUROCAE ED-73C which has been consulted and agreed by the industry.	

comment	*122*	comment by: *AIRBUS*
	Bullet #5:	

	It is proposed to modify bullet n°5 as suggested below: "Set the Aircraft Identification (Flight Id) with the first 8 characters of the company name conducting the test or an explicit Flight Id with airline designation (e.g. ICAO Code), as appropriate. This should be the designation of the operator of the aircraft on which the test is performed."
response	*Not accepted*
	This precaution is in accordance with those specified in EUROCAE ED-73C which has been consulted and agreed by the industry.

comment	*123*	comment by: *AIRBUS*
	Bullet #7: The recommendation given in Bullet n°7 should be deleted from the list of ACASII/Mode S transponder testing precautions. This recommendation is extremely complex to put in place in practice, due to the difficulty to access the antenna on some aircraft. At least, the recommendation should be complemented by the wording "when practicable".	
response	*Accepted*	
	The text has been amended using the words ‘where practicable’.	

comment	*124*	comment by: *AIRBUS*
	Bullet #10: The wording "[...], set altitude to -1000 feet (minus 1000 feet) or less" should be replaced by the wording "[...], when feasible, set barometric altitude to a negative value between -500 feet (minus 500 feet) and -1000 feet (minus 1000 feet)." The proposed recommendation cannot be performed as Mode C/S XPDR cannot transmit an altitude below - 1000 feet, as per ICAO Annex 10, Volume IV, Appendix to Chapter 3.	
response	*Partially accepted*	
	The words ‘or less’ have been deleted from the proposed text.	

comment	*128*	comment by: *skyguide*
	The second but last bullet on this page recommends that during transponder tests the negative altitude of -1000ft should be set. This is contrary to the newly released ICAO Doc 9924 Aeronautical Surveillance Manual, where the initial EUROCAE method was replaced by Doc 9924, Appendix O, § O3.1.2: i) manually set the altitude to an unrealistically high value (i.e. over 60 000 feet);	
response	*Not accepted*	
	This precaution is in accordance with those specified in EUROCAE ED-73C which has been consulted and agreed by the industry. It should also be noted that it is considered impractical to achieve 60,000 ft via a ground test set.	

comment	*129*	comment by: *skyguide*
	The squawk 7776 shall not be used in Switzerland since we have PARROT transponders using this code.	
response	*Noted*	
	The Mode A code 7776 is the code that has been agreed to be used for testing transponders on the ground. However, Appendix 1 second bullet requires the test organisation to contact ATC before starting the test. At this stage, an acceptable squawk code could be agreed between the test organisation and ATC.	

comment	*139*	comment by: *NATS*
	Appendix 1, 5th bullet We question whether a generic text such as "GNDTEST" could be more appropriate in the aircraft ID field rather than the first 8 characters of the company names (which could potentially be mistaken for a callsign in some circumstances). **Appendix 1, 10th bullet** Eurocontrol APDSG IP51.05 proposes that altitude could be set to an unrealistically high value, as an alternative to a negative value. We consider that EASA and Eurocontrol should present a consistent message. If the Eurocontrol approach is accepted then the text shoudl be challenged to something such as: "If testing transponder/ACAS II system parameters that do not require 'altitude', set altitude to -1000 feet (minus 1000 feet) or less, *or an unrealistically high value i.e. over 60000ft*. This will minimise the possibility of ACAS II warning to airfield and over flying aeroplanes." **Appendix 1** Suggest adding an additional bullet as follows for consistency with Eurocontrol APDSG IP51.05: · Set the on-the-ground status for all Mode S replies, except when an airborne reply is required (e.g. for altitude testing)	
response	*Not accepted*	
	Appendix 1 – 5th bullet. The wording is in accordance with that specified in EUROCAE ED-73C which has been consulted and agreed by the industry. Appendix 1 – 10th bullet .It is considered impractical to use unrealistic altitudes. The text is however modified to say '-1000 feet' and not '-1000 feet or less'. This change was a result of comment regarding this Appendix. Appendix 1. 'Set on-the-ground-status' for all Mode S replies. This is achieved by the existing bullet which states that '*In between testing, i.e. to transition from one altitude to another, select the transponder to 'standby' mode'*. It is therefore not considered necessary to add an additional bullet.	

comment	*166*	comment by: *Roland Mallwitz*
	Pg 17, Appendix 1, Ground Testing Precautions	

	The introducing paragraph seems to indicate that 'nuisance' ACAS warnings occur only in areas of high density traffic. While the probability is higher in high density traffic areas such warnings can happen everywhere, if the ground testing is not prepared properly. I suggest to delete then 2nd sentence.
response	*Accepted*
	Text amended.

resulting text	See Appendix D for resulting text.

III Draft Decision AMC 20-15 - Appendix 2: List of Acronyms p. 18

comment	*63*	comment by: *EUROCONTROL - CND/CoE/AT/AO*
	TCAS stands for "Traffic alert and Collision Avoidance System" (refer to ED143). The word "organisation" in the name of EUROCAE is spelt with an s not z.	
response	*Accepted*	
	Text amended.	

resulting text	See Appendix D for resulting text.

C. APPENDICES p. 19

comment	*38*	comment by: *UK CAA*
	Paragraph No: Appendices - General **Comment:** Given that differing styles of ACAS display are in service, the development of an Agency view on the benefits of moving towards a single mandated display format would be constructive.	
response	*Not accepted*	
	The style of the display should be consistent with the flight deck architecture. This architecture is defined by the applicant and defining further display format is considered detrimental to this process.	

comment	*39*	comment by: *UK CAA*
	Paragraph No: Appendices - General **Comment:** Regular updates on the progress of ICAO work to mandate ACAS Software	

	V7.1 would be constructive.
response	*Noted*
	The Agency considers that such an update is not required for an upgrade program and that the operator will have a legal obligation to comply.

C. APPENDICES - I. Impact Assessment - 1.0 Introduction p. 19

comment	*134*	comment by: *EUROCONTROL - CND/CoE/AT/AO*
	Attachment #5	
	It has been brought to EUROCONTROL's attention that a paper produced by MIT Lincoln Labs in the USA [reference] suggests that the probabilities calculated in the SIRE+ study are too conservative (by up to a factor of 4). The MIT paper is attached herewith and the results of 2008 SIRE+ study can be found at: http://www.eurocontrol.int/msa/public/standard_page/ACAS_SIR.html The authors of the SIRE+ study (DSNA & Egis Avia) stand behind the findings of the study. The SIRE+ study has been updated with 2009 monitoring results from UK and French airspace (3,400,000 flight hours). The previously calculated risk of collision (i.e. one collision every 3 years) has been updated. The new figure indicates that the risk of collision with issues SA01 and SA-AVSA is assessed to be one collision every 7.5 years. The corresponding probability (i.e. 9.8×10^{-9} per flight hour) exceeds the tolerable rate for catastrophic events caused by equipment-related hazards by a factor of about 10. If only recently recorded SA01 and SA-AVSA events are considered for calculation, the risk of collision with issues SA01 and SA-AVSA is assessed to be one collision every 9.5 years. The corresponding probability (i.e. 7.6×10^{-9} per flight hour) also exceeds the tolerable rate for catastrophic events caused by equipment-related hazards by a factor of more than 7. The full report will be made to EASA as soon as possible.	
response	*Noted*	
	The Agency thanks Eurocontrol for the information. As stated, although the revised data shows reduced probability of a collision, the estimated risk due to the identified deficiencies in the system is still greater than what is normally considered acceptable. Therefore the Agency still consider it appropriate to mandate the carriage of version 7.1 to mitigate the identified risks.	

C. APPENDICES - I. Impact Assessment - 2.0 Description of the ACAS II Logic Changes p. 19-22

comment	*18*	comment by: *Dassault Aviation*
	<![endif]--> **Improper pilot reaction to ACAS symbology** In reference to paragraph 2.2 (Safety issue SA-AVSA) It is not acceptable that crew *"responds unintentionally in the opposite direction to that specified by the RA".* ACAS symbology provided in the cockpit must be fully understandable by the pilots and pilots must receive the appropriate training to use it. Some aircraft have additional RA symbology in the ADI similar to a Flight Director which can help the pilot to understand better the manoeuvre requested. There is a risk that maintaining inappropriate ACAS symbology even with the new ACAS law will not fix the problem.	
response	*Noted*	
	The Agency thanks you for your comment. Although the symbology has been maintained by the introduction of version 7.1, the aural alerts have been modified to provide an explicate instruction to flight crew. Flight crew compliance with the aural instruction should result in flight crews' correct compliance with the RA.	

comment	*64*	comment by: *EUROCONTROL - CND/CoE/AT/AO*
	2.1. Editorial. Missing word. It should read: "…and the Überlingen accident in 2002."	
response	*Accepted*	

comment	*65*	comment by: *EUROCONTROL - CND/CoE/AT/AO*
	4th paragraph Typo. Missing apostrophe. It should read: "the second aeroplane's ACAS II." Missing caption under Figure 3.	
response	*Accepted*	

C. APPENDICES - I. Impact Assessment - 3.0 Considerations	p. 22

comment	66	comment by: *EUROCONTROL - CND/CoE/AT/AO*
	Missing caption under Figure 4.	
response	*Accepted*	

C. APPENDICES - I. Impact Assessment - 4.0 Actions proposed by the Agency	p. 22-25

comment	10	comment by: *Lufthansa/Lauterbach*
	We do not agree with Appendices I. Impact Assessment par. 4.4 Sector concerned: the statement "... that the majority of cases and in particular for hose aeroplanes equipped with ACAS II (TCAS II Version 7.0), only a software change is required to the existing hardware..." does not reflect reality. **One of the biggest ACAS equipment suppliers (Collins) does not offer a software upgrade for the majority of its equipment in the field**. Therefore Lufthansa Airlines alone needs to replace about 180 aircraft (TCAS computers), as they are not modifiable (TTR 920)! A service bulletin may be available late 2011 or only in 2012. Production capabilities at the vendor may allow for 3-4 units per month assigned for Lufthansa. In consequence this requires approx. 52 month minimum retrofit time (4 years and 4 month). Due to the reasons mentioned above the impact to affected operators is significantly higher than described in this NPA. Production capabilities at the vendor will be a limiting factor, which was not taken account for in this mandate proposal!	
response	*Noted*	
	The Agency is fully aware of the process and methods and reliance of vendor production facilities. The proposed dates were developed on the assumption that the upgrades would be software only in accordance with the information received form vendors. Regarding the mandated carriage compliance date, the Agency notes that the original proposed dates were ambitious. An ambitious compliance is required in order to achieve the full safety benefits associated with version 7.1; however following additional comments the Agency has amended the compliance date to the 1 December 2015.	

comment	50	comment by: *Egis Avia*
	There is a typo in para. 4.1: "... is considered **too** be inappropriate ..." should be "... is considered **to** be inappropriate ..."	

response	*Accepted*

comment	*51*	comment by: *Egis Avia*
	Typo in para. 4.2.1: "... European airspace being equipped **the** version 7.1." should be "... European airspace being equipped **with** version 7.1.".	
response	*Accepted*	

comment	*67*	comment by: *EUROCONTROL - CND/CoE/AT/AO*
	4.2.1 3rd paragraph "As Europe is not the "state of design" for the majority of ACAS II systems…" Currently, no ACAS II system are manufactured in Europe. In fact, USA is the "state of design" for all of currently commercially available ACAS II systems.	
response	*Noted*	
	This does change the intent of the paragraph.	

comment	*68*	comment by: *EUROCONTROL - CND/CoE/AT/AO*
	Table. Column "Manufacturer A", second row. Typo in second line – missing 000. The amount should be €75,**000.**	
response	*Accepted*	
	The figure should read € 75,000.	

comment	*106*	comment by: *Continental Airlines*
	A requirement to retrofit TCAS V7.1 by 2014 would have a very large cost impact on Continental Airlines, as it has a large number of TCAS Processors which are incapable of an upgrade to V7.1 and would have to be replaced at high cost. Continental Airlines concurs with the ATA / FAA comments that a mandate of V7.1 by 2014 would result in a requirement for repetitive retrofits, at high cost impact, in an unnacceptably short time period, and should therefore be avoided.	
response	*Noted*	
	See response to comment 102.	

comment	*167*	comment by: *Roland Mallwitz*
	Pg 25, table If I would be the owner of an old aircraft I would go for manufacturer A as the equipment costs are just "up to 75 EUR".	
response	*Noted*	

The figure should read € 75,000.

comment	*172*	comment by: *IFATCA*
	Editorial - Manufacturer A is ”up to 75 Euro for older aircraft” – perhaps this is meant to be up to 75,000 Euro.	
response	*Noted*	
	The figure should read € 75,000.	

C. APPENDICES - I. Impact Assessment - 5.0 Conclusion p. 25

comment	*40*	comment by: *UK CAA*
	Page 25, Paragraph No: Appendices **Comment:** There are several typographical errors in the Appendices. All are relatively unimportant, with the exception of Table 1 (page 25), which appears to state that a TCAS v7.1 retrofit by Manufacturer A could cost 'up to €75 for older aeroplanes'. This is surely not correct?	
response	*Accepted*	
	The figure should read € 75,000.	

Appendix A — Resulting text to Draft Opinion for Implementing Rule — AIRSPACE USAGE REQUIREMENTS

Article 1

Applicability

This Regulation lays down common requirements and procedures for all users of the airspace to which the Treaty applies.

Article 2

Definitions

For the purpose of this Regulation the following definitions apply:

~~ACAS II means an airborne collision avoidance system based on secondary surveillance radar transponder signals which operates independently of ground-based equipment that provides vertical resolution advisories in addition to traffic advisories~~.

~~Resolution Advisory (RA) means a warning to the flight crew of an imminent collision threat, combined with commands for the crew to use in avoiding an airborne collision.~~
Airborne collision avoidance system (ACAS) means an aircraft system based on secondary surveillance radar (SSR) transponder signals which operates independently of ground-based equipment to provide advice to the pilot on potential conflicting aircraft that are equipped with SSR transponders.

ACAS II means an ACAS which provides vertical resolution advisories in addition to traffic advisories.

Resolution advisory (RA) means an indication given to the flight crew recommending:
a) a manoeuvre intended to provide separation from all threats; or
b) a manoeuvre restriction intended to maintain existing separation.

~~Traffic Advisory (TA) means a caution to the flight crew that an aircraft has become a potential collision threat.~~

Traffic advisory (TA) means an indication given to the flight crew that the proximity of another aircraft is a potential threat.

Article 3

Airspace Usage

Users of the airspace as defined in Article 1 shall comply with the requirements as specified in Annex 1.

Article 4

Entry into force

1. This Regulation shall enter into force on the 1 March 2012.

~~2. Notwithstanding 1, this Regulation shall only apply to aeroplanes with an individual certificate of airworthiness issued before 1 March 2012, after 1 March 2014.~~

2. By way of derogation from paragraph 1, in the case of aircraft with an individual certificate of airworthiness issued before 1 March 2012, the provisions of paragraphs AUR.ACAS.100 (a) and (b) of Annex 1 shall only apply after 1 December 2015.

This Regulation shall be binding in its entirety and directly applicable in all Member States.

Appendix B — Resulting text ANNEX 1 PART AUR

ANNEX 1

PART AUR

SUBPART ACAS— Airborne Collision Avoidance Systems (ACAS) II

Section I — General Requirements

AUR.ACAS.001 SCOPE

This subpart establishes the specific requirements for the carriage of ACAS II equipment to be met by all operators operating as General Air Traffic undertaking flights within the airspace above the territory ~~of the Member States~~ to which the Treaty applies.

Section II — Equipment

AUR.ACAS.100 Performance Requirement

~~ACAS II, with collision avoidance logic version 7.1, shall be carried by all turbine-powered aeroplanes which;~~

~~(a) have a maximum certificated take-off mass exceeding 5700 kg~~

~~or~~

~~(b) are authorised to carry more than 19 passengers~~

~~or~~

~~(c) any other aeroplane equipped with ACAS II.~~

(a) All turbine-powered aeroplanes which:

1. have a maximum certificated take-off mass exceeding 5700 kg

   or

2. are authorised to carry more than 19 passengers

shall be equipped with ACAS II with collision avoidance logic version 7.1.

(b) Aircraft not referred to in (a) but that are also equipped with ACAS II, shall have collision avoidance logic version 7.1.

Section III — Operations

AUR.ACAS.200 Use of ACAS II

(a) ACAS II shall be used ~~in normal conditions~~ during flight in a mode that enables ~~Resolution Advisories (~~RAs~~)~~ to be produced for the flight crew when undue proximity to another aircraft is detected, unless inhibition of RA mode (using TA only or equivalent) is called for by a abnormal procedure or due to performance limiting conditions.

(b) When an RA is produced by ACAS II,

1. the pilot flying shall immediately ~~take the corrective action~~ conform to the indications ~~indicated by~~ of the RA, even if this conflicts with an Air Traffic Control (ATC) instruction, unless doing so would jeopardise the safety of the aircraft ~~aeroplane~~;

   ~~and~~

2. as soon as possible, as permitted by flight crew workload, notify the appropriate ATC unit of any RA which requires a deviation from the current ATC instruction or clearance;

3. ~~2.~~ when the conflict is resolved ~~clear of conflict is enunciated~~, the aircraft ~~aeroplane~~ shall:

   (i) be promptly returned to the terms of the acknowledged ATC instruction or clearance and ATC notified of the manoeuvre,

   or

   (ii) comply with any amended ATC clearance or instruction issued.

~~(c) ACAS II training programmes shall be established so that the flight crew;~~

~~1. are appropriately trained in the avoidance of collisions~~

~~and~~

~~2. are competent in the use of ACAS II equipment~~

AUR.ACAS.300 ACAS II Training

ACAS II operational procedures and training programmes shall be established so that the flight crew is appropriately trained in the avoidance of collisions and competent in the use of ACAS II equipment.

Appendix C — Resulting text Draft Decision Acceptable Means of Compliance

~~AMC.AUR.ACAS.200 Use of Airborne Collision Avoidance System (ACAS) II~~

~~1. ACAS II OVERVIEW~~

~~1.1 The information provided by ACAS II is intended to assist flight crew in the safe operation of an aeroplane by providing advice on appropriate action to reduce the risk of collision. This is achieved through Resolution Advisories (RAs), which propose manoeuvres, and through Traffic Advisories (TAs), which are intended to prompt visual acquisition and to act as a warning that an RA may follow. TAs indicate the approximate positions of intruding aircraft that may later cause an RA. RAs that propose manoeuvres in the vertical plain are predicted to increase or maintain separation from the threatening aircraft.~~

~~1.2 ACAS II indications should be used by the flight crew in the avoidance of potential collisions, the enhancement of situational awareness and the active search for and visual acquisition of conflicting traffic.~~

~~1.3 Nothing in the procedures specified in 2 hereunder shall prevent flight crew from exercising their best judgement and full authority in the choice of the best course of action to resolve a traffic conflict or avert a potential collision.~~

~~Note 1: The ability of ACAS II to fulfil its role of assisting flight crew in the avoidance of potential collisions is dependent on the correct and timely response by the flight crew to ACAS II indications. Operational experience has shown that the correct response by flight crew is dependent on the effectiveness of the initial and recurrent training in ACAS II procedures.~~

~~Note 2: The normal operating mode of ACAS II is TA/RA. The TA only mode of operation is used in certain aeroplane performance limiting conditions caused by in-flight failures or as otherwise promulgated by the Competent Authority.~~

~~2. USE OF ACAS INDICATORS~~

~~2.1 The indications generated by ACAS II should be used by the flight crew in conformity with the following safety considerations:~~

~~a) flight crew should not manoeuvre their aeroplane in response to TAs only;~~

~~Note 1: TAs are intended to alert flight crew to the possibility of an RA, to enhance situational awareness, and to assist in visual acquisition of conflicting traffic. However, visually acquired traffic may not be the same traffic causing a TA. Visual perception of an encounter may be misleading, particularly at night.~~

~~Note 2: The above restriction in the use of TAs is due to the limited bearing accuracy and to the difficulty in interpreting altitude rate from displayed traffic information.~~

~~b) on receipt of a TA, flight crew should use all available information to prepare for appropriate action if an RA occurs;~~

~~and~~

~~c) in the event of an RA, flight crew should:~~

1) respond immediately by following the RA as indicated, unless doing so would jeopardise the safety of the aeroplane;

Note 1: Stall warning, wind shear, and ground proximity warning system alerts have precedence over ACAS II.

Note 2: Visually acquired traffic may not be the same traffic causing an RA. Visual perception of an encounter may be misleading, particularly at night.

2) follow the RA even if there is a conflict between the RA and an Air Traffic Control (ATC) instruction to manoeuvre;

3) not manoeuvre in the opposite sense to an RA;

Note: In the case of an ACAS II–ACAS II coordinated encounter, the RAs complement each other in order to reduce the potential for collision. Manoeuvres or lack of manoeuvres that result in vertical rates opposite to the sense of an RA could result in a collision with the intruder aeroplane.

4) as soon as possible and as permitted by flight crew workload, notify the appropriate ATC unit of RAs which required a deviation from the current ATC instruction or clearance;

Note: Unless informed by the flight crew, ATC may not know when ACAS II issues an RA. It is possible for ATC to issue instructions that are unknowingly contrary to ACAS II RA instructions. Therefore, it is important that ATC be notified when an ATC instruction or clearance is not being followed because it conflicts with an RA.

5) promptly comply with any modified RAs;

6) limit the alterations of the flight path to the minimum extent necessary to comply with the RAs;

7) promptly return to the terms of the ATC instruction or clearance when the conflict is resolved;
and

8) notify ATC when returning to the current clearance.

3. HIGH VERTICAL RATE (HVR) ENCOUNTERS

3.1 Flight crew should use appropriate procedures by which an aeroplane climbing or descending to an assigned altitude or flight level, especially with an autopilot engaged, may do so at a rate less than 8 m/s (1 500 ft/min) throughout the last 300 m (1 000 ft) of climb or descent to the assigned altitude or flight level. This should be accomplished when the flight crew are made aware of another aircraft at or approaching an adjacent altitude or flight level, unless otherwise instructed by ATC. These procedures are intended to avoid unnecessary ACAS II RA's in aeroplanes at or approaching adjacent altitudes or flight levels.

AMC AUR.ACAS.300 ACAS II Training

1. GENERAL

The ACAS II operational procedures and training programmes established by the operator should take into account the guidance material contained in:

a. ICAO Annex 10, Volume IV[1];

b. ICAO PANS-OPS, Volume 1[2];

c. ICAO PANS-ATM[3]; and

d. ICAO guidance material 'ACAS Performance-Based Training Objectives' (published under Attachment E of state letter AN 7/1.3.7.2-97/77).

[1] ICAO Annex 10 — Aeronautical Telecommunications, Volume IV — Surveillance and Collision Avoidance Systems.

[2] ICAO Doc 8168-OPS/611 — PANS-OPS (Procedures for Air Navigation Services-Aircraft Operations), Volume I — Flight Procedures.

[3] ICAO Doc 4444-ATM/501 — PANS-ATM (Procedures for Air Navigation Services-Air Traffic Management).

Appendix D — Resulting text Draft Decision AMC 20-15

AMC 20-15

AMC 20-15: Airworthiness Certification Considerations for the Airborne Collision Avoidance System (ACAS II) with optional Hybrid Surveillance

1 PREAMBLE

This Acceptable Means of Compliance (AMC) provides a means that can be used to obtain an airworthiness approval for the installation of ACAS II equipment which may include optional hybrid surveillance. It is issued to support the operational requirement that requires the carriage of ACAS II.

Hybrid Surveillance is an optional feature that allows ACAS II to use a combination of active surveillance, i.e. actively interrogating the Mode-S Transponders of surrounding aircraft, and passive surveillance, i.e. use of ADS-B position and altitude data (extended squitter), to update an ACAS II track.

An applicant may elect to use an alternative means of compliance. However, those alternative means of compliance must meet safety objectives that are acceptable to the Agency. Compliance with this AMC is not mandatory. ~~Use of the terms *shall* and *must* apply only to an applicant who elects to comply with this AMC in order to obtain airworthiness approval.~~

2 REFERENCE MATERIAL

2.1 EU/EASA

EU OPS[4] 1.160, 1.668, 1.1045, 1.398

CS 25.1301, 1302, 1309, 1322, 1333, 1431, 1459, 1529 and 1581.

CS 23.1301, 1309, 1322, 1431, 1459, 1529 and 1581.

CS 27.1301, 1309, 1322, 1459, 1529 and 1581

CS 29.1301, 1309, 1322, 1333, 1431, 1459, 1529 and 1581

AMC 25.1302, AMC 25.1309, AMC 25.1322 and AMC 25-11.

ETSO-C113	Airborne Multipurpose Electronic Displays
ETSO-C119c	Traffic Alert and Collision Avoidance System (TCAS) Airborne Equipment, TCAS II.
ETSO-2C112()	Air Traffic Control Radar Beacon System/Mode Select (ATCRBS/Mode S) Airborne Equipment

2.2 Other documents

EUROCAE ED-143 including change 1	Minimum Operational Performance Standards for Traffic Alert and Collision Avoidance Systems (TCAS) Airborne Equipment.

[4] Council Regulation (EEC) No 3922/91 on the harmonisation of technical requirements and administrative procedures in the field of civil aviation. Regulation as last amended by Regulation (EC) No 1899/2006 of the European Parliament and of the Council of 12 December 2006 (OJ L 377, 27.12.2006, p. 1).

AMC 20-15

EUROCAE ED-112	Minimum Operational Performance Specification for Crash Protected Airborne Recorder Systems
RTCA DO-300 including change 1	Minimum Operational Performance Standards (MOPS) for Traffic Alert and Collision Avoidance System II (TCAS II) Hybrid surveillance.

3 MINIMUM EQUIPMENT QUALIFICATION

3.1 An acceptable minimum certification standard for the ACAS II equipment including optional hybrid surveillance is EASA ETSO-C119c.

3.2 An acceptable minimum certification standard for the associated Mode S transponder is EASA ETSO-2C112().

~~4 SAFETY OBJECTIVES~~

~~The applicant shall perform a Functional Hazard Assessment (FHA) and System Safety Assessment (SSA) to establish the ACAS II criticality and hazards associated with the proposed installation. The reliability level of the system must be commensurate with the following probabilities:~~

~~**4.1** The probability of failure of the installed system to perform its intended function from a reliability and availability perspective must be shown to be no greater than $1x10^{-3}$ per flight hour.~~

~~**4.2** The probability of failure of the system to provide the required aural and visual alerting functions without a failure indication must be shown to be no greater than $1x10^{-4}$ per flight hour.~~

~~**4.3** The probability of false or misleading alerts due to a failure of the system when no collision threat exists be shown to be no greater than $1x10^{-4}$ per flight hour in the terminal environment and $1x10^{-5}$ per flight hour in the en-route environment.~~

~~4.**4** Failure of the installed ACAS II must not degrade the integrity of any Essential or Critical system which has an interface with the ACAS II.~~

4 SAFETY OBJECTIVES

The applicant should perform a Functional Hazard Assessment (FHA) and System Safety Assessment (SSA) to establish the ACAS II criticality and hazards associated with the proposed installation. The reliability level of the system must be commensurate with the assessed criticality, and compliance with this criticality level should be demonstrated. For the purposes of this AMC, system includes all airborne devices contributing to the ACAS II function. Guidance is provided in AMC 25.1309. Acceptable criticality levels for functionality and alerts are given below:

Guidance for other aircraft category may be found in FAA AC 23-1309-1(), AC 27-1B or AC 29-2C.

4.1 The probability of failure of the installed system to perform its intended function from a reliability and availability perspective should be shown to be no greater than 1×10^{-3} per flight hour.

AMC 20-15

4.2 The probability of failure of the system to provide the required RA aural and visual alert, when required, without a failure indication should be shown to be no greater than 1×10^{-4} per flight hour in the terminal environment and 1×10^{-5} per flight hour in the en-route environment. See note 1.

4.3 The probability of a false or misleading RA aural and visual alert due to a failure of the system should be shown to be no greater than 1×10^{-4} per flight hour in the terminal environment and 1×10^{-5} per flight hour in the en-route environment. See note 1.

Note: The definition of a 'misleading alert' is when an RA condition exists, and an RA is issued, but the RA gives incorrect guidance. The definition of a 'false alert' is when an RA is issued, but an RA condition does not exist.

4.4 Failure of the installed ACAS II must not degrade the integrity of any Essential or Critical system which has an interface with the ACAS II.

The use of Hybrid Surveillance including transitions from active to passive surveillance and vice versa, using a system that complies with the requirements of RTCA DO-300 including Change 1, is assumed not to compromise the safety of ACAS II.

Note 1**:** In terminal airspace the frequency of encounters, where another aircraft could be present, may be assumed to be once every 10 hours. In en-route airspace the frequency of encounters, where another aircraft could be present, may be assumed to be once every 200 hours. Different frequencies may be used if supported by operational data

5 HARDWARE AND INSTALLATION

5.1 General Considerations:

The installation ~~shall~~ should include as a minimum a single ACAS II system and a single Mode S Transponder that meet the requirements of paragraph 3.

5.2 Aural Alerts:

(a) TA and RA aural alerts will need to be presented by the prescribed voice announcements via flight deck loudspeakers.

(b) Consideration should be given to presenting ACAS II voice announcements via headsets at a preset level. ~~particularly where active noise-reducing headsets are used~~.

(c) A means for the pilot to cancel active voice announcements and visual indicators is permitted but should not be necessary where voice announcements have a specific duration.

(d) The ACAS II voice announcements should be consistent with the general philosophy of other flight deck aural alerting systems. In particular, the prioritisation and compatibility of alerts and voice announcements from different warning systems should be consistent with each other. The alert priorities should be wind shear,

AMC 20-15

TAWS and then ACAS II. Altitude callout advisories which occur simultaneously with ACAS II ~~cautions and warnings~~ advisories are permitted, but the audibility of each voice alert will need to be understandable.

(e) The adequacy of aural levels will need to be demonstrated.

5.3 Displays & Indications

(a) Warning and Caution alerts should comply with the guidance provided in AMC 25.1322 unless otherwise stated in this AMC.

(b) The display of Traffic and Resolution Advisory information should be consistent with the guidance provided in AMC 25.1322 and with paragraph 5.4 of AMC 25.1302.

(c) Resolution Advisory guidance ~~must~~ should be presented at each pilot station in the pilot's primary field of view.

Resolution Advisories may be presented on EFIS or IVSI displays provided their primary functions are not compromised.

(d) ~~A discrete red warning Resolution Advisory enunciator must be located in each pilot's primary field of view.~~

~~An Instantaneous Vertical Speed Indicator (IVSI) with a lighted red arc or an electronic attitude display with an alphanumeric message may be acceptable instead of a discrete warning enunciator~~.

A discrete red warning Resolution Advisory enunciator or an Instantaneous Vertical Speed Indicator (IVSI) with a lighted red indication or Primary Flight Display (PFD) with a lighted red indication or an electronic attitude display with an alphanumeric message, should be located in each pilot's primary field of view.

(e) A means to display traffic information to both pilots ~~must~~ should be provided. Traffic information may be provided on weather radar (WXR), Electronic Flight Instrument System (EFIS), Instantaneous Vertical Speed Indicator (IVSI) or other compatible display screen which has been demonstrated to meet the guidance of AMC 25-11, provided their primary functions are not compromised. A separate dedicated traffic display, readily visible to both pilots, is an acceptable alternative. In case a Multi Function Display is used, the display should meet the requirements of ETSO-C113.

(f) Discrete TA caution lights are optional.

(g) ACAS II Resolution and Traffic Advisories which trigger the Master Warning System will not be accepted.

(h) An indication of ACAS II system and sensor failures which prevents correct operation ~~Resolution Advisories~~ should be provided.

(i) An indication that the ACAS II system is operating in TA mode ~~only,~~ should be provided.

(j) ACAS II should be automatically switched to TA mode, if ACAS II and wind shear voice or ACAS II and TAWS voice announcements occur simultaneously.

(~~j~~k) The adequacy of display visibility needs to be demonstrated.

(l) The flight crew should be aware, at all times, of the operational state of the ACAS II system. Any change of the operational state of the ACAS II system is to be enunciated to the flight crew via suitable means.

5.4 ACAS II Controls:

(a) Control of the ACAS II should be readily accessible to the flight crew.

(b) A means to initiate the ACAS II Self Test function should be provided.

5.5 Antennas:

(a) Either a directional antenna and an omni-directional antenna, or two directional antennas may be installed.

Note: when installing a directional antenna and an omni-directional antenna the omni-directional antenna should be the lower antenna.

(b) The physical locations of the transponder antennas and the ACAS II antennas will need to satisfy isolation and longitudinal separation limits. The physical location ~~must~~ should also ensure that propellers do not interfere with system operation, if applicable. ACAS II antennas may be installed with an angular offset from the aircraft ~~aeroplane~~ centreline not exceeding 5 degrees.

5.6 Interfaces:

(a) ~~Pressure altitude information will need to be obtained from the sensor source that supplies the Mode S Transponder and which is the most accurate source available on the aeroplane. This source should supply information (with appropriate segregation) to the flight deck altitude display(s). The air data sensor should supply pressure altitude information in either databus or synchro format~~.

~~Note:1 Either a databus or synchro source is the preferred interface as it avoids the altitude jump risk inherent in ICAO Gray (Gillham) format encoders.~~

~~Note 2 Where a databus or a synchro source is not available, an acceptable alternative is two independent altitude encoders supplying altitude information in ICAO Gray (Gillham) format together with a comparator capable of detecting and responding to encoder malfunctions. A resolution of 100ft is provided by a ICAO Gray (Gillham) format encoder as used for transponder altitude reporting. The ICAO Gray (Gillham) altitude encoding format is defined in the appendix to Chapter 3 of ICAO Annex 10, Volume IV.~~

Pressure altitude information will need to be obtained from the same sensor source that supplies the Mode S Transponder(s) and the flight deck altitude display(s). This source should be the most accurate source available on the aircraft. Altitude information should be provided via a digital databus. ICAO Gray (Gillham) code should **not** be used.

(b) An interface to a radio altimeter sensor should be provided.

(c) Inhibit logic selected for input to the ACAS II to take account of the aircraft ~~aeroplane~~ performance limitations will need to be evaluated and justified unless accepted for an earlier ACAS II standard.

(d) Other interfacing for discrete data should ~~shall~~ be provided, as required.

(e) The ACAS II installation should ~~must~~ provide an interface with the flight recorder(s).

(f) Recording of ACAS II data should be accomplished in accordance with EUROCAE ED-112. ~~Recording of the "ACAS vertical data word" on the flight recorder is required unless it can be shown, to the satisfaction of the Agency, to be impractical, in which case at least the RA discrete should be recorded~~.

Note: Information necessary to retrieve and convert the stored data into engineering units should be provided. ~~The operator of the aeroplane will need to update the document which contains information necessary to retrieve and convert the stored data into engineering units~~.

(g) Interfaces between systems should be analysed to show no unwanted interaction under normal or fault conditions.

6 CERTIFICATION TESTING

Ground testing will need to be performed with due consideration of the possible risk of nuisance advisories in operating aircraft ~~aeroplanes~~. The precautions provided in Appendix 1 should be followed ~~obeyed~~.

6.1 The bulk of testing for a modification to install ACAS II can be achieved by ground testing that verifies system operation and~~,~~ interfaces with ~~between affected~~ aircraft ~~aeroplane~~ systems. ~~, correct warning prioritisation, and freedom from unwanted interaction.~~

6.2 The ground tests should include:

i. ~~a~~ verification check of the ICAO 24 bit airframe address. ~~If altitude information supplied to the transponder is in ICAO Gray (Gillham) code format a check for correct operation of the altitude comparator should also be included.~~

ii. bearing accuracy check of intruder. A maximum error of ± 15 degrees in azimuth should be demonstrated for each quadrant. Larger errors may be acceptable in the tail area of the aircraft.

iii. failure of sensors which are interfaced to ACAS II. A test should be performed to ensure that the effect on ACAS II agrees with the predicted results.

iv. correct warning prioritisation. The alert priorities should be wind shear, TAWS and then ACAS II.

v. electromagnetic interference evaluation to ensure that ACAS II does not cause interference with other aircraft systems.

vi. the correct operation of any aircraft configurations which result in, by design, the inhibition of RAs.

6.3 ~~Flight testing of an initial installation should evaluate overall operation, surveillance range, target azimuth reasonableness, freedom from unwanted interference, and to assess, during adverse flight conditions, instrument visibility, display lighting, sound levels and intelligibility of aural messages, and the effects of electrical transients~~

AMC 20-15

Flight testing of an initial installation should evaluate overall operation including:

i. surveillance range.

Note: Surveillance range may vary depending on airspace conditions.

ii. target azimuth reasonableness.

iii. freedom from unwanted interference.

iv. assessment, during adverse flight conditions, of instrument visibility, display lighting, sound levels and intelligibility of aural messages.

v. the effects of electrical transients.

vi. validity and usability of Traffic information when the aircraft is subject to attitude changes of ± 15 degrees in pitch and ± 30 degrees in roll.

v. the correct operation of any aircraft configurations which result in, by design, the inhibition of RAs.

Note: these tests may be considered to be a subset of the ground tests performed in paragraph 6.2 vi. Only those aircraft configurations which are practical to perform in an airborne environment need to be assessed.

vi. electromagnetic interference evaluation to ensure that ACAS II does not cause interference with other aircraft systems.

6.4 Flight testing to demonstrate RA performance in a planned encounter between aircraft ~~aeroplanes~~ will not normally be required for an ACAS II – Mode S equipment combination, previously demonstrated as performing correctly. Planned encounter flight testing should not be attempted without the agreement of the Agency ~~responsible Competent Authorities~~.

6.5 To minimise the certification effort for ACAS II for additional aircraft types listed in the type certificate ~~follow-on installations~~, the applicant may claim credit, for applicable certification and flight test data obtained from equivalent ~~aeroplane~~ aircraft installations, including testing performed for ~~T~~ACAS II version 6.04A or 7.0. Flight Testing of ACAS II will not normally be required where acceptable evidence exists relating to the previous certification standard of ~~T~~ACAS II. This assumes the introduction ACAS II involves equipment replacements only.

6.6 The upgrade from ACAS II version 7.0 to version 7.1 may be classified as a minor change, provided that equipment changes are only applicable to the ACAS II processor and compliance with JAA TGL No 8 revision 2 was previously demonstrated. Flight testing will not normally be required. The existing AFM should be reviewed and amended as required to reflect the difference in aural warnings.

6.7 Equipment that meets the acceptable minimum certification standard for the ACAS II equipment (see paragraph 3.1) has demonstrated that hybrid surveillance function does not degrade the performance of the ACAS II active surveillance. Therefore, when the optional hybrid surveillance function is enabled, specific installation testing of this function is not required.

AMC 20-15

7 MAINTENANCE

The Instructions for Continued Airworthiness (ICA) should ~~must~~ include the following:

7.1 Maintenance instructions for on-aircraft ~~aeroplane~~ ACAS II testing including the precautions of Appendix 1.

7.2 Maintenance instructions for the removal and installation of any directional antenna should include instructions to verify the correct display of ACAS II traffic in all four quadrants.

8 AIRCRAFT FLIGHT MANUAL/PILOT OPERATING HANDBOOK

The Aircraft Flight Manual (AFM) or the Pilots Operating Handbook (POH) should provide at least the following limited set of information. This limited set assumes that a detailed description of the installed system and related operating instructions are available in other operating or training manuals.

Note: ~~Aeroplane~~ Aircraft malfunctions which would prevent the ~~aeroplane~~ aircraft from following ACAS II climb indication ~~commands~~, and which do not automatically inhibit the ACAS II climb indication ~~commands~~, should be addressed (e.g. as a cautionary note) in the AFM/POH.

8.1 Limitations Section: The following Limitations will need to be included:

(a) Deviation from the ATC assigned altitude is authorised only to the extent necessary to comply with an ACAS II Resolution Advisory (RA).
(b) Manoeuvres ~~must~~ should not be based solely on information presented on the traffic display.

8.2 Emergency Procedures Section: none.

8.3 Normal Procedures Section: The ACAS II flight procedures should address the following:

(a) For a non-crossing RA, to avoid negating the effectiveness of a coordinated manoeuvre by the intruder aircraft, advice that vertical speed should be accurately adjusted to comply with the RA.
(b) ~~For a crossing RA, a warning that~~ Non-compliance by one aircraft can result in reduced vertical separation with the need to achieve safe horizontal separation by visual means.
(c) A caution that under certain conditions, indicated ~~commanded~~ manoeuvres may significantly reduce stall margins with the need to respect the stall warnings.
(d) Advice that evasive manoeuvring should be ~~made with the autopilot and autothrottle disengaged, and~~ limited to the minimum required to comply with the RA.
(e) When a Climb RA is given with the aircraft ~~aeroplane~~ in landing configuration, a normal go-around procedure should be initiated.

9 MINIMUM EQUIPMENT LIST

The operator's Minimum Equipment List (MEL) will have to be amended in accordance with the MMEL requirements of the Agency.

10 AVAILABILITY OF DOCUMENTS

EASA documents may be obtained from EASA (European Aviation Safety Agency), 101253, D50452 Koln Germany or via the Website: http://www.easa.europa.eu/ws_prod/g/rg_certspecs.php.

EUROCAE documents may be purchased from EUROCAE, 102 rue Etienne Dolet, 92240 Malakoff, France, (Fax: +33 1 46 55 62 65), or website: www.eurocae.net

RTCA documents may be obtained from RTCA Inc, 1828 L Street, NW., Suite 805, Washington, DC 20036, USA, (Tel.: 1 202 833 9339; Fax: 1 202 833 9434). Website: www.rtca.org.

FAA documents may be obtained from Superintendent of Documents, Government Printing Office, Washington DC, 20402-9325, USA. Website: www.faa.gov/aviation.htm.

AMC 20-15
Appendix 1

APPENDIX 1: ACAS II / Mode S Transponder Ground Testing Precautions:

Transponder/ACAS II system testing is a known source of 'nuisance' ACAS II warnings. ~~The problem of 'nuisance' ACAS II warnings is more noticeable when ground testing of transponders takes place at facilities located beneath Terminal Control Areas or in the vicinity of Control Areas and Zones where air traffic movements are likely to be numerous.~~ The following information provides ~~guidelines~~ guidance which should be followed to minimise this risk:

- When not required, ensure all transponders are selected to 'OFF' or 'Standby'.

- Before starting any test, contact the local Air Navigation Service Provider (ANSP) or Air Traffic Service (ATS) and advise them of your intention to conduct transponder testing. Advise of your start time and test duration. Also inform them of the altitude(s) at which you will be testing, your intended Aircraft Identification (Flight Id) and your intended Mode A code.

- ~~The use of a ground station to simulate an airborne intruder should not be attempted other than with the agreement of the Agency and the Competent Authority.~~

- Set the Mode A code to 7776 (or other Mode A code agreed with Air Traffic Control Unit).

  Note: The Mode A code 7776 is assigned as a test code by the ORCAM Users Group, specifically for the testing of transponders.

- Set the Aircraft Identification (Flight Id) with the first 8 characters of the company name. This is the name of the company conducting the tests.

- Where possible, perform the testing inside a hangar to take advantage of any shielding properties it may provide.

- As a precaution, where practicable, use antenna transmission covers whether or not testing is performed inside or outside.

- When testing the altitude (Mode C or S) parameter, radiate directly into the ramp test set via the prescribed attenuator.

- In between testing, i.e. to transition from one altitude to another, select the transponder to 'standby' mode.

- If testing transponder/ACAS II system parameters that do not require 'altitude', set altitude to – 1000 feet (minus 1000 feet) ~~or less~~. This will minimise the possibility of ACAS II warning to airfield and over flying ~~aeroplanes~~ aircraft.

- When testing is complete select the transponder(s) to 'OFF' or 'Standby'.

AMC 20-15
Appendix 2

APPENDIX 2: List of Acronyms

ACAS	Airborne Collision Avoidance System
AMC	Acceptable Means of Compliance
ANSP	Air Navigation Service Provider
ATC	Air Traffic Control
ATCRBS	Air Traffic Control Radar Beacon System
ATS	Air Traffic Service
CS	Certification Specifications
EASA	European Aviation Safety Agency
EFIS	Electronic Flight Instrument System
ETSO	European Technical Standard Order
EUROCAE	European Organisation ~~Organization~~ for Civil Aviation Equipment
FHA	Failure Hazard Analysis
ICA	Instructions for Continued Airworthiness
ICAO	International Civil Aviation Organization
IVSI	Instantaneous Vertical Speed Indicator
MEL	Minimum Equipment List
MMEL	Master Minimum Equipment List
ORCAM	Originating Region Code Allocation Method
RA	Resolution Advisory
SSA	System Safety Assessment
TA	Traffic Advisory
TCAS	Traffic Alert and Collision Avoidance System
WXR	Weather Radar

Appendix E — Attachments

ATA Comments on EASA NPA 2010-03.pdf
Attachment #1 to comment #102

GAMA10-20, EASA NPA 2010-03, Introduction of ACAS II software version 7.pdf
Attachment #2 to comment #147

TRAFFIC COLLISSION AVOIDANCE SYSTEM VERSION 7.1.pdf
Attachment #3 to comment #8

NPA 2010-03_AMC 20-15_20100423.pdf
Attachment #4 to comment #13

42PM-TCAS-0070.pdf
Attachment #5 to comment #134