Appendix
to Opinion No 15/2016

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1. Summary of comments and responses

Please refer to the related Opinion No 15/2016 for the summary of the comments received.

2. Individual comments and responses

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

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

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

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

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

(General Comments)	-

comment	*1* comment by: *NHF Technical committee* Norsk Helikopteransattes Forbund does on a general basis, for security purposes, recommend that TAWS system are installed in all aircrafts performing CAT operations.
response	*Noted* EASA will issue for information, as a complement to the draft rule text proposed by Opinion No 15/2016, a safety information bulletin (SIB) to recommend that all aircraft within the scope of the task install a terrain awareness warning system (TAWS). In addition, this comment is being addressed in a special safety risk portfolio for helicopter operations in the context of the EASA Annual Safety Review 2016.

comment	*25* comment by: *DGAC France* DGAC France has no specific comment on this NPA
response	*Noted*

comment	*31* comment by: *Luftfahrt-Bundesamt* The LBA has no comments on NPA 2015-21.
response	*Noted*

comment	*34* comment by: *Federal Office of Civil Aviation (FOCA), Switzerland* The Federal Office of Civil Aviation (FOCA) appreciates the opportunity to comment on the NPA 2015-12 TAWS operations in IFR and VFR, and TAWS form turbine-powered aeroplanes

	under 5700 kg MCTOM able to carry six to nine passengers.
response	*Noted*

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comment	*3* comment by: *ESSP-SAS* (Section 2.3 pag. 4) In paragraph 2 of the summary of the RIA a justification is given to equip all aircraft in Europe with at least TAWS Class B. No distinction is done between commercial and non-commercial aviation.
response	*Noted* This paragraph is part of the regulatory impact assessment (RIA) summary, which refers to all aircraft as the advantages of installing the TAWS equipment are considered for all cases. In a further analysis, commercial and non-commercial operations are studied within different options.

comment	*4* comment by: *ESSP-SAS* (section 2.3, page 4) Paragraph 3 of the summary of the RIA lists the possibilities to generate the options of the RIA. None of the options analysed in Chapter 4 cover the second possibility, “Requirements for new aircraft performing non-commercial operations”. No justification is given to keep this possibility out of the scope of the options. Therefore this possibility is left out when evaluating the different aspects to drift the final proposal, being rejected without any other considerations or comparison with the other options.
response	*Noted* Paragraph 3 does not list the final options, it only explains how the final options were selected. As stated, a matrix was created to assess all possibilities (which would include requirements for new aircraft performing non-commercial operations). However, in analysing all the options, the results achieved were the same for several of them; the final options were chosen by grouping those results into only four main categories for simplification purposes.

1. Procedural information p. 3

comment

16 comment by: *ESSP-SAS*

(Section 3.1.1, page 6)

SPO.IDE.A.130 requirement for TAWS is replicated in current EASA regulation (965/2012 amended on 800/2013) to NCO and NCC aircraft (NCO.IDE.A.130 and NCC.IDE.A.135). Similarly, FAA regulation on non-commercial aviation (91.223) requires the use of TAWS Class B for all turbine powered aircraft with more than 6 seats. This NPA is not imposing such mandate on NCC/NCO aircraft which will constitute a difference with respect to ICAO recommendation and FAA regulation. In addition, if current EASA regulation on NCC/NCO aircraft is to remain as it is now, aircraft accommodating more than 9 seats which receive CofA after 2011 shall be equipped with Class A TAWS, while FAA is only requesting Class B. This could have an impact on aircraft units which are imported from or manufactured in the US. Current FAA regulation is only requesting Class A TAWS for Non-Schedule/Air-taxi aircraft with more than 9 seats (135.154) or all air carriers (121.354) regardless their size. In addition, current EASA regulation is requesting Class B TAWS for piston (reciprocating-engine) aircraft in commercial operations, which is not requested by FAA nor recommended by ICAO. This could lead to a heterogeneous scenario between EU and US.

response

Noted

The possible impact on harmonisation with the Federal Aviation Administration (FAA) was considered in the RIA for aircraft within the scope of this RMT, within which fall aeroplanes having a maximum certified take-off mass (MCTOM) of less than 5 700 kg or a maximum operational passenger seating configuration (MOPSC) between six and nine.

The mandate of this RMT did not include reviewing current regulations on the basis of aircraft beyond the scope of the task. Some existing rule text is only presented in this NPA to facilitate readability and show where the new requirements have been inserted.

comment

17 comment by: *ESSP-SAS*

(Section 3.1.1, page 6)

Class A TAWS are becoming more and more popular. This is also reflected in the Appendix 6 survey, where the ratio of Class A installations from factory is expected to increase compared to Class B. In the same way, operators might opt for retrofitting Class A systems instead of Class B. This shouldn't represent a major problem. However, current EASA regulation (AMC20.28) requires the capability to provide an alert for excessive downward deviation from the glide path when performing LPV approaches if a Class A is installed. The development of this alerting capability or the interfacing with the TAWS system to do so is proving very challenging in several aircraft models mainly due to the the variety of FMS/radios/TAWS configurations. This could jeopardise the certification and use of these

	vertically guided procedures which are meant to increase safety. The support for Class A alerting on LPV approaches was not included by FAA until TSO-C151c amendment in 2012. In addition, ETSO-151b seems to be the last ETSO version released by EASA and there is no reference to LPV operations. This could imply that US/EU manufacturers will develop TAWS A solutions which are not necessarily compatible with EASA LPV requirements even for new manufactured units.
response	*Noted* The mandate of this RMT is to require the installation of only TAWSs B, and any voluntary equipage of a TAWS A does not affect the current rules with respect to a Mode 5 call-out.

3. Proposed amendments p. 6

comment	*2* comment by: *Harri Heikkilä* Concerning SPO.IDE.A.130 In parachute dropping flight operations the desired flight profiles sometimes conflict with the standards used to design TAWS equipment. Due to this TAWS equipment do not bring the same safety benefit as in other operation types and the operation of TAWS equipment is usually inhibited during the flight. Aviastar Helsinki Oy suggests that if the operator decides to operate parachute dropping flights (limited to VFR) without TAWS equipment it shall specify the means (flight procedures, local procedures, crew training) which are used to mitigate the associated safety risks. Ie. aircraft used primarily for parachute dropping should be exempted from TAWS requirement. This matches for example to the requirements applied by FAA in USA as well.
response	*Noted* If within the scope, these operations should also be covered by the requirement as they do not differ in this regard from other SPO commercial operations.

comment	*6* comment by: *ESSP-SAS* (Section 3.1.1, page 6), (Section 4.1 page 7) ICAO recommends in Annex 6 PI and PII the use of TAWS Class B for commercial and general aviation equipped with turbine power engine. These provisions are adopted in FAA regulation (91.223, 135.154). This NPA only focuses in commercial aircraft, so European regulation still does not follow ICAO recommendation for general aviation.
response	*Noted*

	The NPA is consistent with the ICAO recommendations since it requires aeroplanes within the scope of the task and used in commercial operations to install a TAWS B. Additionally, considering the safety benefits of a TAWS installation, EASA will issue a recommendation for all aeroplanes within the scope of the task to install the equipment, including aeroplanes performing non-commercial operations.
comment	*24* comment by: *FAA* 1. The FAA notes that if enacted, this rulemaking would exclude all turbine powered airplanes (under 5,700 kg) performing non-commercial operations, and all turbine powered airplanes (under 5,700 kg), regardless of their operational use, built before 2019. 1. Throughout the NPA, EASA notes the safety benefits derived from TAWS installation. Excluding the community highlighted above would diminish the potential safety benefits associated with this rule. According to an EASA survey referenced in this NPA (page 9, section 4.1.3), 20% of respondents indicated that the airplanes in their fleet were TAWS equipped. Even if the estimated retro-fit rate of 1.2% per year (page 13, section 4.5.2) continued, and we assume that aging aircraft are retired at a rate consistent with recent trends, it will still be well over a decade before EASA will realize the majority of the safety benefits to be derived from this rule. 1. Although the proposed rule would differ from regulations promulgated by the FAA, the issue of general aviation (GA) proportionality is one with which we share EASA's sensitivities. The FAA therefore understands EASA's desire to avoid imposing additional rules on the GA community, particularly a costly rule such as this. While it is completely appropriate to allow the GA community to decide what risks it is willing to accept, it is more difficult to justify giving commercial air operators that same latitude. The FAA therefore recommends that EASA consider a retro-fit requirement for airplanes performing commercial air transport operations.
response	*Noted* Mandatory retrofit of existing aircraft within the scope of the task was discarded for the reasons explained in the NPA. As it was concluded in the RIA, the large cost of retrofit outweighs the small safety benefit. However, EASA will issue a recommendation for all aeroplanes within the scope of the task to install the equipment on a voluntary basis.
comment	*30* comment by: *Finnish Transport Safety Agency* Finnish Transport Safety Agency supports the proposed amendments to CAT.IDE.A.150 and SPO.IDE.A.130.
response	*Noted*

Thank you for your support.

comment

32 comment by: *THALES AVIONICS*

This NPA requires carriage of a TAWS A / TAWS B equipment without indicating which performance and qualification standard it will have to comply with : a reference to ETSO C151c would be likely adequate. Also at system level after installation on aircraft an Advisory Material would be necessary (equivalent FAA AC 25-23) to specify minimum performance and certification requirements.

response

Noted

The mandate of this NPA refers to TAWSs B.

The existing GM1 CAT.IDE.A.150 becomes applicable to the new requirement and states:

'An acceptable standard for Class A and Class B TAWS may be the applicable European technical standards order (ETSO) issued by the Agency or equivalent.'

At aircraft level, compliance with Subpart E of CS-ACNS 'Airborne Communications, Navigation and Surveillance' is required.

comment

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

Sweden supports the proposal.

response

Noted

Thank you for your support.

4. Regulatory impact assessment (RIA) — 4.1. Issues to be addressed p. 7-10

comment

7 comment by: *ESSP-SAS*

(Section 4.1, page 8)

The last paragraph of Issue 1 references action item AER3,6 in European Aviation Safety Programme. The correct reference seems to be European Safety Plan 2012-2015

response

Accepted

Thank you for the comment, the reference is indeed 'European Aviation Safety Plan (EASP) 2012-2015'.

EASA accepts your comment and will take it into consideration when drafting the final rule.

comment	*8* comment by: *ESSP-SAS* (section 4.1.1, page 9) A justification to equip all aircraft in Europe with at least TAWS B is given again "Following the recommendation put forward by Annex 6 of the Chicago Convention, the FAA requires that aircraft within the scope of this task be equipped with, at least, TAWS B. This could potentially justify why all new aircraft are delivered with this system in Europe, even if this is not mandatory." "As a result of the mandate by the FAA to install TAWS in all turbine-powered air carrier operations in the U.S. and other countries, there was a worldwide reduction of CFIT accidents". Nevertheless NPA only aligns the regulatory proposal with ICAO and FAA approach in commercial turbine aircraft, general aviation is out of the scope.
response	*Noted* Indeed, the regulatory proposal does not include non-commercial operations, and the reasons are explained in the NPA. However, EASA will issue a recommendation for all aeroplanes within the scope of the task to install the equipment on a voluntary basis.

comment	*18* comment by: *UK CAA* **Page No:** 8 **Paragraph No:** Issue 2, paragraph 2 beginning “In the past, although pilots ….” **Comment:** The UK CAA recommends that substantiation data to support these statements should be provided or the Agency should clarify whether they are based on anecdotal evidence or opinions. **Justification:** To improve transparency and objectiveness.
response	*Noted* The supporting data for the paragraph at stake is the information obtained from the Safety Analysis & Research Department, which elaborated a Safety Recommendation (SR) Initial Evaluation for SR FRAN-2009-009 included in the French BEA Accident Investigation Report (Nov2-I080628).

comment	*19* comment by: *UK CAA* **Page No:** 8 **Paragraph No:** Issue 2, paragraph 5 beginning “However, updated information…” **Comment:** The UK CAA recommends that substantiation data to support these statements should be provided or the Agency should clarify whether they are based on anecdotal evidence or opinions.

Justification: To improve transparency and objectiveness

response

Noted

This paragraph is based on the statements of the rulemaking group (RMG) members after their assessment of the standards of the equipment currently installed in the aircraft.

comment

20 comment by: *UK CAA*

Page No: 9

Paragraph No: 4.1.3, paragraph 1, sentence beginning - "Manufacturers selling in Europe and the US follow the recommendation from ICAO and offer this system with their new aircraft"

Comment: It is recommended that the Agency should clarify if this is a fact or an assumption based on the survey results or other anecdotal evidence or opinions.

Justification: To improve transparency and objectiveness.

response

Noted

This paragraph is based on the information provided by the General Aviation Manufacturers Association (GAMA) and United States of America (USA) aircraft manufacturers.

comment

26 comment by: *THALES AVIONICS*

We support the EASA proposition to mandate to additional classes of aircraft installation of TAWS, since this new system called TAWS, superseding the previous system called GPWS, has proven to be far more effective than the previous GPWS system. Indeed, even if it has allowed to avoid several CFIT accidents, the previous GPWS was unfortunately well known for its insufficient performances (nuisance alerting rate, late alerting and lack of crew confidence).

It should be clearly stated that the TAWS is a substitute to the GPWS system in order to alleviate GPWS drawbacks.

response

Accepted

Thank you for your support.

The requirement is indeed for TAWSs B and not GPWSs. EASA accepts your comment and will take it into consideration when drafting the final rule.

comment

27 comment by: *THALES AVIONICS*

Issue 2 :

It is written : "pilots assumed TAWS genrated false alarms and therefore this ... lack of

confidence of some flight crews towards the TAWS ... "

Such statement is confusing, since it is mixing the previous situation with GPWS for which many false alarms were encountered resulting in lack of confidence of some flight crews, with the current TAWS performances which has been designed to alleviate previous GPWS performance limitations.

It is sugested to review the current text and replacing "TAWS" by "GPWS" wherever appropriate in order to suppress such confusion.

response *Accepted*

Indeed, the NPA text reads 'TAWS' although it refers to GPWS performance issues.

EASA accepts your comment and will take it into consideration when drafting the final rule.

comment *28* comment by: *THALES AVIONICS*

RIA: This Regulatory Impact Assesment is analysing the benefits of TAWS for additional categories of aircraft.

However to ensure appropriate impact assessment based on TAWS expected performances, a clear definition of TAWS functionalities and minimum acceptable performances should be officially released, in a recognized standard document or at least with reference to ETSO C151c.

response *Noted*

Although a specific reference is not provided, the issue is already addressed in the existing GM1 CAT.IDE.A.150 that becomes applicable to the new requirement and states:

'An acceptable standard for Class A and Class B TAWS may be the applicable European technical standards order (ETSO) issued by the Agency or equivalent.'

At aircraft level, compliance with Subpart E of CS-ACNS 'Airborne Communications, Navigation and Surveillance' is required.

4. Regulatory impact assessment (RIA) — 4.3. Policy options p. 10-11

comment *9* comment by: *ESSP-SAS*

(Section 4.3, page 11)

The text quotes "it was decided to only recommend these systems to aircraft within the scope of the task performing this type of operations" for non-commercial aircraft. Despite this decision no recommendation for the use of TAWS B in general aviation is given

response *Noted*

The recommendation cannot be provided through a rule amendment. After this RMT is accomplished, EASA intends to publish an SIB that will address all aircraft within the scope of the task and recommend the installation of the equipment.

comment

10 comment by: *ESSP-SAS*

(Section 4.3, page 11)

It is noted that any option considers to forward-fitting TAWS in non-commercial operations, despite the survey shows that all new aircraft are equipped with TAWS.

response

Noted

Should this comment refer to the NPA not considering an option for 'forward-fitting TAWSs for non-commercial operations', please refer to the response to Comment No 4 on p. 5. All possible options were considered separately. In drafting the document, several options were grouped together, taking into account the equal results achieved when performing the risk analysis of each and every one of the options; this is how the final options were chosen.

comment

21 comment by: *UK CAA*

Page No: 11

Paragraph No: 1, sentence beginning "As there have been no accidents with aircraft performing non-commercial operations in the last ten years…"

Comment: UK CAA believes that the intended meaning is accidents that could have been prevented using TAWS, and suggests the text should be amended as shown below.

Justification: To improve accuracy and clarity.

Proposed Text: "As there have been no accidents with aircraft performing non-commercial operations in the last ten years **that could have been prevented using TAWS** …"

response

Accepted

The sentence refers to the data obtained when analysing the number of accidents related to this RMT. The result of said analysis was that there were no accidents with aircraft performing non-commercial operations. Thus, installing the equipment could have not improved the situation.

EASA accepts your comment and will take it into consideration when drafting the final rule.

comment

22 comment by: *UK CAA*

Page No: 11

Paragraph No: 3, sentence beginning "… However, all new aircraft are fitted with TAWS A or

B…"

Comment: It is unclear whether this statement is based on the results of the survey and if so, whether the survey included responses from all aircraft manufacturers selling in Europe. If the statement is not based on the survey results, the UK CAA requests clarification on what this statement is based on.

Justification: The accuracy of this statement is very important for the safety impact assessment of the various regulatory options.

response

Noted

The sentence is based on the survey results. The aim of EASA was to obtain data from some European operators and manufacturers of aircraft that would be operating in Europe and would therefore be subject to European regulations. More details about the survey are contained in Section 4.4.2 of the NPA (p. 12) as well as in the Appendix thereto (p. 20).

comment

29 comment by: *THALES AVIONICS*

Policy options are considering several options, in particular with different types of TAWS (Type A, Type B).

However a clear definition of TAWS functionalities and Type categories should be officially released, in a recognized standard document or at least with reference to ETSO C151c.

response

Noted

Please refer to the response to Comment No 28 above.

comment

35 comment by: *Federal Office of Civil Aviation (FOCA), Switzerland*

FOCA is supporting Option 2 with deadline for implementation RetroFit till 2030. However FOCA would prefer a shorter deadline (e.g. 2020).

response

Noted

Option 2 is not the preferred option. The requirement will only affect turbine-powered aeroplanes with an individual certificate of airworthiness (CofA) issued after 1 January 2019. Notwithstanding, EASA will issue at a later stage an SIB to recommend that all aeroplanes within the scope of the task install a TAWS or similar.

4. Regulatory impact assessment (RIA) — 4.5. Analysis of impacts p. 12-16

comment

11 comment by: *ESSP-SAS*

(Section 4.5.4, page 15)

	GA economic impact assessment is not justified. The text uses Option 1 in GA assessment but it only affects to commercial aviation (see Table 1 in page 10, Option 1 Forward fit TAWS commercial and discarded options). Option 1 should not be considered at this point of the RIA.
response	*Noted* The economic impact was not the only one taken into consideration when studying the effects of installing the equipment in non-commercial aircraft. Proportionality issues and the absence of accidents were also two important factors in the analysis. However, EASA is aware of the benefits of the installation of the equipment and, therefore, it will be recommending it to all aircraft within the scope of the task regardless of the mandate.

comment	*12* comment by: *ESSP-SAS* (Section 4.5.4, page 16) No justification is given to consider TAWS equipment "disproportionate in terms of cost for GA". The survey shows that the cost seem to be affordable for GA users as the 100% of the aviation sold (6.3.1) or to be delivered in the next 5 years a (6.3.2) are going to be equipped with TAWS A or B, which seems to be the same exact driver to define a requirement for commercial aviation.
response	*Noted* This statement refers also to retrofitting. Regardless of whether all delivered aircraft may have the equipment installed, existing aircraft would be obliged to install it as well. The cost of retrofitting it to aircraft performing non-commercial operations would be, indeed, disproportionate and cannot be justified by the safety impact.

comment	*13* comment by: *ESSP-SAS* (Section 4.5.5, page 16) Option 1 is incomplete as it does not take into account non-commercial operations. Harmonisation with FAA and ICAO is not complete
response	*Noted* Please refer to the responses to Comments No 4 and 10 above, as well as to p. 4 of the NPA, where it is explained how the final options were selected.

comment	*23* comment by: *UK CAA* **Page No:** 12 **Paragraph No:** 4.5.1, paragraph 3, sentence beginning “Moreover, aircraft in Europe would

not be obliged to have the system repaired in case of breakdown. Nevertheless, these possibilities are assumed to be very rare"

Comment: The UK CAA believes the assumption that operators will very rarely deactivate the system may not be entirely accurate. This assumption may influence the outcome of the safety impact assessment.

It is recommended that the Agency reconsiders the likelihood of having a deactivated system and reviews the safety impact assessment accordingly

Justification: We tend to agree that the deactivation of the system because of a breakdown is unlikely. However, TAWS require periodic terrain/obstacle/runway database updates which are costly, especially for non-commercial operators who obtained the system as a "bonus" (fitted in the aircraft by default although not legally required in Europe). Out of date obstacle (or runway) data can be a fairly common source of nuisance alerts (in comparison to hard failures) and therefore could be a more compelling reason for deactivating the system.

response *Noted*

Justification for this statement is provided in several parts of the NPA: e.g. Section 4.5.3, Option 0, second paragraph (p. 14). In any case, deactivation or not activation of the system is assumed to be rare for the following reasons:

— the system is part of an integrated avionics system, and its malfunction will likely result in malfunctioning of other systems;

— when fitted, the system is part of the aircraft build standard and is controlled through the master minimum equipment list (MMEL)/minimum equipment list (MEL); as a consequence, for commercial operators, it is operable/repaired in accordance with the MMEL/MEL limitations; and

— to remove the system from an aircraft equipped with a TAWS would require a 'major change'/supplemental type certificate (STC) approval that EASA would probably not grant without having mitigating limitations like 'Day visual flight rules (VFR) only' or 'other TAWSs'.

EASA is considering if actions may be required to deal with outdated terrain databases.

6. Appendix p. 20-24

comment *14* comment by: *ESSP-SAS*

(Section 6.2, 6.3; page 20,21)

The survey does not make any distinction between general aviation and commercial aviation. 95% of delivered aircraft are equipped with TAWS Class B and 91% of future deliveries are going to be equipped with TAWS Class B. A mandate to equip Class B TAWS for general aviation does not seem to make any economic impact in industry.

response | *Noted*

The survey did make a distinction between non-commercial and commercial operations. The Appendix shows the results displayed in various ways, which is relevant for informative purposes. The fact that the results of non-commercial and commercial operations are displayed together in some cases does not mean that the survey did not collect the data for each category separately.

comment | *15* comment by: *ESSP-SAS*

(Section 6, page 20)

The survey is missing inputs from important manufacturers like Cessna, Piper or Hawker Beechcraft which represent 80% of the European fleet within the task. Most of their new models seem to include Class B TAWS from factory but there might be some exceptions like some Piper models for which the installation is optional. The results of the survey have led to certain assumptions/conclusions like the one given in Paragraph 2 in section 4.5.1 which should be further analysed.

response | *Noted*

Although we aimed to reach all manufacturers producing aircraft for European operators, not all manufacturers responded. Conclusions are based on the information obtained.