



Corrigendum to A-NPA 2012-01 of 28 February 2012 on Harmonised Transition Altitude

The Agency has identified a typographical error under point 20 in the published A-NPA 2012-01.

On page 6, point 20:

for: 'HETA PIA also makes recommendation in its chapter 8 that the preferred option is considered to be Option 2.',

read: 'HETA PIA also makes recommendation in its chapter 8 that the preferred option is considered to be Option 3.'.

To correct the error the Agency issued this corrigendum on 20 March 2012.

European Aviation Safety Agency

ADVANCE NOTICE OF PROPOSED AMENDMENT

A-NPA 2012-01

RMT.0378 (ATM.021a)

Harmonised Transition Altitude

- **General comments to the A-NPA + Appendix 1 should be submitted using the Comment Response Tool ([CRT](#)).**
- **For detailed questions regarding the A-NPA, please refer to the online IPM questionnaires (please refer to the links on page 8).**

EXECUTIVE SUMMARY

1. The Problem

Transition Altitude (TA) as defined in ICAO Doc.8168 (PANS-OPS) is 'the altitude at or below which the vertical position of an aircraft is controlled by reference to altitudes. PANS-OPS provides that a transition altitude shall normally be specified for each aerodrome by the State in which the aerodrome is located and that 'the height above the aerodrome of the transition altitude shall be as low as possible but normally not less than 900 m (3 000 ft)'. In addition, PANS-OPS (Doc 8168) stipulates in chapter 2.1.2.5 that 'the calculated height of the transition altitude shall be rounded up to the next full 300 m (1 000 ft)'.

PANS-OPS also provides that a transition altitude may be established for a specified area on the basis of regional air navigation agreements.

The wide variety of TAs used across Europe, the need to change altimeter settings during critical departure and approach phases of flight, and the fact that some TAs do not adequately take into account terrain clearance and minimum safe altitudes, leads to the potential for confusion and errors on the flight deck resulting in safety issues.

A significant factor contributing to this situation is the fact that ICAO provisions for the determination of TAs were written in the late 1950s and do not reflect modern flight procedures or set out clear and harmonised criteria for setting TAs. Another factor is a historic lack of coordination between neighbouring Air Navigation Service Providers (ANSPs) and States when determining the TA.

2. The approach

In the Single Sky Committee (SSC/41), the Member States agreed on launching a joint group of Commission, the European Aviation Safety Agency (hereafter referred to as 'the Agency¹'), EUROCONTROL and the Member States to develop a robust Regulatory Impact Assessment as well as possible legal material on the regulatory harmonisation of the European transition altitude.

The Commission tasked the Agency in conjunction with EUROCONTROL to start a pre-rulemaking phase and publish an Advance Notice of Proposed Amendment (A-NPA) for the harmonisation of the European transition altitude.

In 2011 EUROCONTROL launched a Harmonised European Transition Altitude Task Force (HETA TF) with the participation of stakeholders, EUROCONTROL and EASA representatives. The task of HETA TF was also to 'develop a Regulatory Impact Assessment, preparing the possible development of an Implementing Rule for a common EU wide transition altitude.' The work of HETA TF was accomplished at the end of 2011 by providing a Preliminary Impact Assessment (PIA), based on three identified regulatory options.

3. The purpose of this Advance Notice of Proposed Amendment is to collect from the stakeholders:

- a. their opinion on the proposed regulatory options;

¹ The Agency is directly involved in the rule-shaping process. It assists the Commission in its executive tasks by preparing draft regulations for the implementation of the Basic Regulation and amendments thereof, which are adopted as 'Opinions' (Article 19(1)). It also adopts Certification Specifications, Acceptable Means of Compliance and Guidance Material to be used in the certification process and to facilitate the implementation of the Basic Regulation and its implementing rules (Articles 18(c) and 19(2)).

- b. additional data in order to further refine the impact assessment including its quantification where possible.
4. The next steps:
- a. based on the outcome of this A-NPA and HETA TF Preliminary Impact Assessment to develop a thorough Regulatory Impact Assessment (RIA) for the harmonisation of European TA;
 - b. following the advice of the Member States in Single Sky Committee to decide on further rulemaking activities for the harmonisation of European TA.

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A. Explanatory Note

I. Introduction

1. Transition Altitude (TA) as defined in ICAO Doc.8168 (PANS-OPS) is 'the altitude at or below which the vertical position of an aircraft is controlled by reference to altitudes.' Current ICAO PANS-OPS recommends the harmonisation of the transition altitude on a regional basis, but does not determine any particular altitude. Instead it simply states that the height above the aerodrome of the transition altitude should be 'as low as possible', but not less than 900 metres above terrain. In addition, PANS-OPS (Doc 8168) stipulates in chapter 2.1.2.5 that 'the calculated height of the transition altitude shall be rounded up to the next full 300 m (1 000ft)'.
2. However, this provision appears to be rather out dated as it was originally established in the late 1950s and does not reflect the performance of modern aircraft, flight procedures and terminal areas (i.e. the areas where transition altitude often resides) that are becoming extremely congested. ICAO provisions also do not set out clear and harmonised criteria for setting TAs.
3. In establishing Functional Airspace Blocks (FABs) various Member States have encountered difficulties related to the fact that transition altitudes are not harmonised in Europe. Hence, they have contacted the Commission and the Agency. It should be noted that since 2000 work inside EUROCONTROL has been on-going to resolve the issue.
4. Considering the lack of progress in harmonisation over the last decade, it is quite likely that harmonisation can be achieved only by means of EU-legislation, meaning by a (binding and enforceable) Implementing Rule (IR) and Acceptable Means of Compliance or Guidance Material (AMC/GM) where appropriate, which specify the minimum harmonisation requirements and required procedures as a part of the airspace concept to optimise departure and approach procedures, improve safety and contribute to achievement of the performance targets.
5. The Member States (MS) representatives in Single Sky Committee (SSC/41), agreed on launching a joint group of Commission, the Agency, EUROCONTROL and the Member States to develop a robust Regulatory Impact Assessment (RIA) as well as possible legal material on the regulatory harmonisation of the European transition altitude. The impact assessment should be communicated to, and discussed in the SSC, before further regulatory action is undertaken.
6. Following the SSC decision the Commission tasked the Agency, in conjunction with EUROCONTROL, to start a pre-rulemaking phase and to publish an Advance Notice of Proposed Amendment (A-NPA) for the harmonisation of the European transition altitude.

As, meanwhile the EUROCONTROL Network Operations Team had established a 'Harmonised European Transition Altitude Task Force' (HETA TF) with the attendance of Agency-Experts and the task to '...also develop a Regulatory Impact assessment, preparing the possible development of an Implementing Rule for a common EU wide transition altitude', it was agreed, in accordance with the working arrangements between the EASA and EUROCONTROL, that the work of this HETA TF would be the most appropriate input for the purposes of this A-NPA.

II. Process and scope

7. The Agency developed this A-NPA in line with the Rulemaking Procedure².
8. This rulemaking activity is included in the Agency's Rulemaking Programme for 2012 in line with the Rulemaking Procedure. It implements the rulemaking task RMT.0378 (ATM.021a) 'Harmonised Transition Altitude'.
9. The text of this A-NPA has been developed by the Agency, legally based on article 8b (1) with Annex Vb (1) of Regulation (EC) No 216/2008³ (the 'Basic Regulation') and based on the input of the HETA TF. It is submitted for consultation of all interested parties in accordance with Article 52 of the Basic Regulation and Articles 5(3), 6 and 14 of the Rulemaking Procedure.
10. The goal is to expose the identified regulatory options and to collect from stakeholders detailed information on their preferences and where possible a quantified impact assessment. It is also intended to get a better assessment of the rate of occurrences relevant to TA and altimeter settings. A confidential questionnaire is included at the end of this A-NPA and stakeholders (Flight crews, ANSP, Operators, Competent Authorities, Military Authorities) are invited to respond.
11. After the review and the analysis of this A-NPA collected information, the Agency will further evaluate and amend the HETA TF Impact Assessment (Preliminary Impact Assessment – Appendix 1 to this A-NPA). The updated Regulatory Impact Assessment (RIA) together with the Agency's view on the preferred option will be presented to MS in the SSC and following the outcome of this consultation if deemed necessary, further rulemaking action could be launched in accordance with the Agency rulemaking procedures.

III. Summary Regulatory Impact Assessment

A. Regulatory options

12. The following regulatory options have been evaluated:
 - Option 1 - Do nothing (No Regulatory Intervention);
 - Option 2 - Implementing Rule to Implement a HETA at 18 000 ft;
 - Option 3 - Implementing Rule prescribing common criteria for the determination of the TA at or above 10 000 ft.
13. Option 1 – Do nothing (No Regulatory Intervention) is that the Member States, would continue to proceed with, and further evolve, current initiatives without an overarching regulatory requirement being introduced to enforce a particular resolution or approach to the problem. Nevertheless, this 'Status Quo' scenario takes into account on-going activities on TA issues at the level of ICAO and Functional Airspace Blocks (FABs).

² The Agency is bound to follow a structured rulemaking process as required by Article 52(1) of the Basic Regulation. Such process has been adopted by the Agency's Management Board and is referred to as the 'Rulemaking Procedure'. See Management Board Decision concerning the procedure to be applied by the Agency for the issuing of opinions, certification specifications and guidance material (Rulemaking Procedure), EASA MB 08 2007, 13.6.2007.

³ OJ L 79, 19.3.2008, p. 1 Regulation (EC) No 216/2008 of the European Parliament and the Council of 20 February 2008 on common rules in the field of civil aviation and establishing a European Aviation Safety Agency, and repealing Council Directive 91/670/EEC, Regulation (EC) No 1592/2002 and Directive 2004/36/EC (OJ L 79, 19.3.2008, p. 1). Regulation as last amended by Regulation (EC) No 1108/2009 (OJ L 309, 24.11.2009, p. 51).

14. Option 2 – Implementing Rule mandating a HETA at 18 000 ft. is to take regulatory action to implement a HETA of 18 000 ft. across European airspace.
15. During the work of the EUROCONTROL HETA TF, other altitudes were also evaluated. However, the general agreement amongst the airspace experts was that, 18 000 ft. was the best candidate. A HETA of 18 000 ft is also in line with IFALPA policy, and feedback from some States shows that the 18,000 ft option is the preferred value from airspace users. In addition, the preliminary assessments from the UK indicate the demand for a significantly higher TA (18 000 ft) than the existing TA to adapt for the challenges in future TMA operations (in a ten-year perspective).
16. It is foreseen that this regulatory option includes development of an IR and AMC and GM where appropriate.
17. Option 3 – Implementing Rule prescribing common criteria for the determination of the TA at or above 10 000 ft is to take regulatory action to establish a commonly accepted set of criteria for the determination of a TA in Europe at or above 10 000 ft, and to prescribe a coordinated approach to be taken by neighbouring States/FABs/ANSPs when establishing TAs and associated procedures. Within this option, ANSPs would maintain some flexibility to consider the local environment, but the prescribed minimum altitude ensures the adaptation of the TA to better reflect preferred flight deck operations.
18. Compared with Option 2, this approach would not prescribe a specific value for a HETA, only a minimum value of 10 000 ft with generic requirements, complemented by AMC and GM, where appropriate, for establishing the TA to be used. The regulation to be developed would mandate a harmonised approach and would require Member States to establish a TA at or above a minimum altitude of 10 000 ft. The AMC/GM would not only pave the way for a harmonised determination of the TA but would also give room for consideration of local constraints. The resulting AMC/GM would not only need to describe the criteria to be applied when determining the TA in MS but also the coordination procedures within FAB. There would be also means for establishing interfaces with adjacent airspace, other than the FAB that the Member State belongs to, with the aim to agree on a common TA.
19. Detailed comparison on the identified options could be found in chapter 6 'Comparison of Options' of HETA PIA (Appendix 1 to this A-NPA).
20. HETA PIA also makes recommendation in its chapter 8 that the preferred option is considered to be Option 3.

B. Most important impacts identified for each option?

21. Impact of Option 1 - Do nothing:
 - there would be no change to existing safety levels, but the potential risks from non-standardised altimeter setting procedures across European airspace would remain;
 - no need for additional training for the pilots or Air Traffic Controllers (ATCOs);
 - current risks of confusion and errors on the flight deck would remain;
 - no loss of existing useable flight levels and no additional costs would be imposed on stakeholders;
 - potential for an improved use of Continuous Descent Operations (CDOs), as well as high performance departure procedures/CCOs, may not be fully realised.
22. Impact of Option 2 - Implementing Rule to Implement a HETA at 18 000 ft:
 - harmonisation would lead to increased flight deck awareness and reduced workload in critical phases of flight, but there could be increased workload from a greater number of aircraft requiring frequent QNH adjustments;

- additional training for the pilots and Air Traffic Controllers (ATCOs) would be required;
 - would potentially increase ATCO workload for area controllers providing ATS to aircraft below 18 000 ft, due to need to consider QNH settings and QNH areas;
 - would be advantages for flight crews from a simplified ATM environment across Europe and a more balanced cockpit workload, but there would also be a need for more QNH adjustments;
 - would incur costs for implementation, which cannot be evaluated at this stage;
 - loss of existing useable flight levels is anticipated in some particular areas;
 - capacity and efficiency improving TMA procedures would be potentially better supported by Option 2 but, depending on the transition plan deployed for Option 2, there could be temporary reductions in capacity if the 18 000 ft TA was not implemented concurrently by the MS;
 - potential to improve the use of CDOs and CCOs (Continuous Climb Operations) thus could realise potential environmental benefits of less fuel burn, less CO₂ emissions, and less noise.
23. Impact of Option 3 - Implementing Rule prescribing common criteria for the determination of the TA at or above 10 000 ft:
- local issues and user requirements would be taken into account, and the number of aircraft requiring frequent QNH changes would potentially be less than under Option 2;
 - there would be similar advantages and disadvantages as Option 2, but Option 3 would allow ANSPs more flexibility taking into account local constraints, but there could potentially be a less simplified and predictable ATM environment than under Option 2, because a single TA is not prescribed;
 - additional training for the pilots and Air Traffic Controllers (ATCOs) would be required;
 - would potentially increase ATCO workload for area controllers providing ATS to aircraft below 10 000 ft, due to need to consider QNH settings and QNH areas, but it would be less, compared to Option 2;
 - there would be advantages for flight crews from a simplification of the ATM environment across Europe and a more balanced cockpit workload, but some fragmentation of TAs across Europe could remain;
 - would incur costs for implementation which cannot be evaluated at this stage;
 - capacity and efficiency improving TMA procedures would be supported, but with potentially smaller effect compared to Option 2;
 - potential to improve the use of CDOs and CCOs thus could realise potential environmental benefits of less fuel burn, less CO₂ emissions, and less noise, but limiting the environmental advantage compared to Option 2.

The complete Preliminary Impact Assessment can be found in Appendix 1.

IV. Questionnaire

24. CONFIDENTIALITY: The Agency guarantees the confidentiality of the identity of any communicated information from the responders. The identity of responders will not be mentioned in any publication providing the results and the analysis of the questionnaire. All intellectual property rights, including logo, copyrights, trademarks, and registered trademarks that may be contained within, remain the property of their respective owners. Any personal data included in or relating to the use of this questionnaire shall be

processed pursuant to the provisions of Regulation (EC) No 45/2001 on the protection of individuals with regard to the processing of personal data by the Community institutions and bodies and on the free movement of such data.

25. **Please use one of the following links in order to access the online IPM questionnaire related to your profile:**
- a. **A-NPA 2012-01 ON HETA – A. FLIGHT CREWS**
<http://ec.europa.eu/yourvoice/ipm/forms/dispatch?form=HETAflightcrews&lang=en>
 - b. **A-NPA 2012-01 ON HETA – B. AIRCRAFT OPERATORS (COMMERCIAL AIR TRANSPORTATION)**
<http://ec.europa.eu/yourvoice/ipm/forms/dispatch?form=aircraftoperators&lang=en>
 - c. **A-NPA 2012-01 ON HETA – C. AIR NAVIGATION SERVICE PROVIDERS (ANSPs)**
<http://ec.europa.eu/yourvoice/ipm/forms/dispatch?form=ANSPs&lang=en>
 - d. **A-NPA 2012-01 ON HETA – D. NATIONAL COMPETENT AUTHORITIES (NSAs and CAAs)**
<http://ec.europa.eu/yourvoice/ipm/forms/dispatch?form=NSAsCAAs&lang=en>
 - e. **A-NPA 2012-01 ON HETA – A-NPA ON HETA – E. MILITARY AUTHORITIES**
<http://ec.europa.eu/yourvoice/ipm/forms/dispatch?form=militaryauthorities&lang=en>

V. How to comment on this A-NPA

26. Comments to this A-NPA may be submitted to the Agency within 3 months as of the date of publication in accordance with Article 6(4) of the Rulemaking Procedure.
27. Comments should be submitted by one of the following methods:
- CRT:** Submit your comments to the text of the A-NPA using the Comment Response Tool (CRT) available at <http://hub.easa.europa.eu/crt/>.
- E-mail:** Comments can be sent by e-mail only in case the use of the CRT is prevented by technical problems. The(se) problem(s) should be reported to the [CRT webmaster](mailto:crt_webmaster@easa.europa.eu) and comments should be sent by e-mail to NPA@easa.europa.eu.
- Correspondence:** If you do not have access to the Internet or e-mail, you can send your comments by mail to:
- European Aviation Safety Agency (EASA)
 Rulemaking Directorate
 R.6 – Process Support Department
 Postfach 10 12 53
 D-50452 Cologne
28. The deadline for submission of comments is **29 May 2012**. Comments received after this date may not be taken into account.

29. **Online questionnaires (preferred way of commenting)** are used to collect information from stakeholders. Explanations and links allowing access to these questionnaires are provided in chapter IV and will be accessible during the consultation period of this A-NPA.

VI. Next steps

30. Following the closing of the A-NPA consultation, the Agency will consider all comments and will publish a Comment Response Document (CRD). The CRD will be available on the Agency's website and in the Comment Response Tool (CRT).
31. Based on the inputs made by the stakeholders the Agency will update the HETA TF Impact Assessment (Preliminary Impact Assessment – Appendix 1 to this A-NPA) accordingly.
32. The updated Regulatory Impact Assessment will be presented to the Member States in Single Sky Committee for considering further regulatory developments for the harmonisation of European transition altitude.



B. Appendix 1 - Preliminary Impact Assessment Harmonised European Transition Altitude.

PRELIMINARY IMPACT ASSESSMENT

***Harmonised European Transition
Altitude***

DOCUMENT CONTROL

DOCUMENT CHANGE RECORD

The following table records the complete history of the successive editions of the present document.

Edition Number	Edition Date	Reason for Change	Pages Affected
0.1	03-08-11	Creation of the Strawman Draft PIA	All
0.2	05-08-11	Internal review	All
0.3	17-08-11	Joint update OPL/PRO & SES	All
0.4	15-09-11	Update after comments from EASA and HETA TF	
0.5	03-10-11	Update after HETA TF #3	Option 2
0.6	27-10-11	Update during HETA TF #4	All
0.7	07-11-11	Update for HETA #5	All
0.8	30-11-11	Update after HETA #5	3,5,12,15
1.0	21-12-11	Released Edition 1.0	

Status: Released	Edition No: 1.0	Date: 21 December 2011	Document No: SES/IOP/HETA/PIA /1.0
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executive summary

Background

As a result of interventions made by representatives of Member States at meetings of the SES Single Sky Committee (SSC), and to determine how to best overcome ATM problems associated with fragmented Transition Altitudes (TA) across Europe, EUROCONTROL and EASA were tasked with evaluating the feasibility and impact of implementing a Harmonised European Transition Altitude (HETA) of 18,000 ft. In order to help policy-makers identify if, and to what extent, EU regulatory action is required, a Preliminary Impact Assessment (PIA) has been chosen as the most appropriate tool with which to examine the issues using readily available information. This report presents the results of the PIA.

The Problem

There is potential for confusion and errors on the flight deck, which is caused by the wide variety of TAs used across Europe, the need to change altimeter settings during critical departure and approach phases of flight, and the fact that some TAs do not adequately take into account terrain clearance and minimum safe altitudes. This introduces an operational environment that according to an IFALPA policy statement is unsatisfactory and gives rise to serious operational problems, such as level busts, and consequently in a risk of loss of separation and increased risk of CFIT. The safety issues regarding a low TA were also addressed in a report from the Norwegian Accident Investigation Board, published in 2007.

A significant factor contributing to this situation is the fact that ICAO provisions for the determination of TAs were written in the late 1950s and do not reflect modern flight procedures or set out clear and harmonised criteria for setting TAs. Another factor is a historic lack of coordination between neighbouring ANSPs and States when determining the TA.

The Challenge

In regard to the ATM Master Plan, ESP Plus Programme and SESAR, every contribution is needed in order to facilitate for the expected traffic growths the next 20-30 years, and to ensure flight safety enhancement. New methods for navigation and separation will come with SESAR, in addition to present developments with PBN/RNAV/BARONAV and new ATM Systems like the Point Merge System. Standardised and harmonised procedures will become a key enabler for simplification of the ATM and flight-deck operational environment, which is a key element to meet the future challenges.

Policy Objectives

The overall policy objective is to improve safety and efficiency levels associated with the use of TAs across European Airspace and, specifically, to reduce the incidences of incorrect settings of altimeters when aircraft pass the TA or Transition Level (TL). This shall be achieved without compromising existing safety levels in other areas.

Potential Policy Options

The following policy options have been evaluated in this PIA:

- Option 1 - No Regulatory Intervention;
- Option 2 - Implementing Rule to Implement a HETA at 18,000 ft;
- Option 3 - Implementing Rule Prescribing Common Criteria for the Determination of the TA at or Above 10,000 ft.

Options Appraisal

When comparing Option 2 against Option 1, the PIA analysis highlights that Option 2 would be costly, less acceptable to Stakeholders and the most challenging to implement in the short term, but that the longer term benefits of Option 2 would significantly outweigh those of Option 1. Moreover, Option 2 is entirely consistent with the aims of SES, whereas Option 1 is not at all consistent. The analysis highlights that the costs and disadvantages associated with Option 2 outweigh the benefits as compared to maintaining the 'status quo', particularly in the short term. Nevertheless, if mitigation for costs and local issues could be found for the short term, Option 2 could be considered as a long-term goal through suitable transition measures.

Compared to Option 2, the more flexible Option 3 could be less costly, more acceptable to the majority of Stakeholders and easier to implement. However, Option 2 is more consistent with the aims of SES policy. On balance, it is considered that the PIA analysis highlights that Option 3 could provide a more pragmatic, regulatory solution than Option 2 for the problems associated with TAs across Europe, particularly in the short term.

Conclusions

As a result of this PIA, the following conclusions have been reached:

The HETA TF has studied in detail the various impacts from all angles (see the detailed analysis in attachment A) highlighting a significant number of advantages and disadvantages of the three options chosen.

The multi-criteria analysis of the 3 options evaluated resulted in very close scores. It can be said, however, that option 3 seems to be the preferable option. Since no quantitative data were available, especially the scoring on the cost-criterion was only of qualitative nature. Also the impact on the military - although already considered in the Nordic States feasibility study - needs additional attention.

In summary, the HETA TF drew the following conclusions:

- 1) Developing an Implementing Rule to prescribe common criteria for the determination of TAs above 10,000 ft appears to be more favourable than maintaining the 'status quo' and could provide a more pragmatic regulatory option than a single HETA, particularly in the short term;
- 2) Although the results of the multi-criteria analysis do not provide big differences between the options, it can be deducted that, because of short term costs and implementation challenges, the development of an Implementing Rule to prescribe a HETA of 18,000 ft appears to be less favourable than maintaining the 'status quo';
- 3) Feedback should be requested from a wider range of stakeholders on the three options evaluated, and to collect quantitative data to confirm the results of this PIA;

Recommendations

It is recommended that:

- Regulatory action to prescribe common criteria for the determination of TAs above 10,000 feet should be the preferred option for harmonisation of TAs in European airspace.
- Wider views of Stakeholders, including the impact on the military operations, and additional quantitative data should be sought as a next step in order to confirm the findings of this PIA.

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1. INTRODUCTION

1.1 Purpose of the Document

The purpose of this report is to record the results of a Preliminary Impact Assessment (PIA) on the feasibility of a Harmonised European Transition Altitude (HETA).

1.2 Requirement for an Impact Assessment

Based on interventions made at meetings of the SES Single Sky Committee (SSC) by representatives from Member States, and to overcome ATM problems associated with fragmented Transition Altitudes (TA) in Europe, an initiative was started to evaluate the possibility of migrating to a HETA of 18,000 ft across the whole of EU airspace. In order to help determine the need for potential regulatory action, the SSC supported the setting up of a small task force to carry out a thorough impact assessment of the concept of a HETA. The impact of such a migration has been specifically assessed in addition to other potential options for the problem of fragmented TAs.

A PIA has been chosen as the most appropriate tool with which to examine the issues using readily available information. The PIA will assist in facilitating informed consultation with the affected Stakeholders on any resultant policy proposals, and it will provide a useful input into the development of supporting material for any associated SES implementing rules that may be proposed as part of the overall policy.

1.3 Scope of the Document

Section 2 of this report describes the current situation, identifies the problem and underlying causes and lists the affected stakeholders.

The policy objectives that need to be achieved to overcome the identified issues and problems are set out in Section 3.

The potentially valid options for achieving the policy objectives are described in Section 4, and an analysis of the impact of these options using existing available information is set out in Section 5.

The results of a comparison of the advantages and disadvantages of the potential options are recorded in Section 6.

Finally, conclusions and recommendations for the way forward are set out in Sections 7 and 8 respectively.

This PIA is based on the EASA impact assessment template.

1.4 Consultation and Expertise

In order to assist with the analysis of the potential policy options, and provide necessary information with which to conduct the PIA,

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EUROCONTROL has involved internal EUROCONTROL, EASA and other external expertise from the following specialist areas:

- Regulatory development;
- Impact Assessment;
- HETA Task Force.

2. defining the problem

2.1 Safety occurrences

According to the "Feasibility Study for Transition Altitude Change in Northern Europe", in 2007 the Norwegian Accident Investigation Board (AIB) published a report (SL Rapport 2007/16) on an incident where the incorrect setting of the altimeter resulted in a loss of separation. In the report, the AIB addressed the following safety recommendation: *"From a flight operational point of view, a standardised transition altitude for an as large as possible geographical area is desired. IFALPA recommends the transition altitude to be set at 10000 feet to make the adjustment of QNH at the same time with other regular routines in cockpit. AIB of Norway recommends CAA-N to consider introduction of a common transition altitude higher than those established today in airspace where Norway is in charge of air traffic services."*

Note.- In 2010 IFALPA revised their proposed policy as follows: The common transition altitude shall be either 10,000 feet (3,050 metres), or 18,000 feet (5,500 metres).

During the work on the feasibility study, three of the Nordic States carried out a detailed analysis of safety occurrences in order to assess whether or not altimeter setting procedures had been a contributing factor. In this exercise they found that in the period 2006 to 2008 there were a total of 67 incidents involving incorrect altimeter setting, i.e. relating to failure to use the correct reference, QNH or standard setting.

Furthermore, one other European State did the same detailed analysis and reported that in the years 2007 – 2009 there had been 1287 level busts in that State of which 163 were related to altimeter setting errors. In this context it should be noted that, the errors recorded were only those involving an altitude error of 300 ft or more, i.e. the numbers of altitude setting errors would be higher if those with less than 300 ft had been recorded.

Similar detailed information was not available from other States, since they have not done any detailed analysis of safety occurrences from an altimeter setting point of view. The Task Force therefore concluded that there is a need to obtain more data on altimeter setting errors in other States, which should be obtained through the A-NPA.

More detailed information about altimeter setting error safety occurrences is presented at Annex A.

2.2 Existing Rules & Regulations

ICAO documentation related to this subject is as follows:

- *Procedures for Air Navigation Services – Aircraft Operations (PANS-OPS, Doc 8168) Volume I, Part II, Section 1;*

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- *Procedures for Air Navigation Services – Air Traffic Management (PANS-ATM, Doc 4444);*
- *ATS Planning Manual (ATSPM, Doc 9426).*

The proliferation of TAs within the European Airspace is a direct result of the application by States of the aforementioned ICAO provisions related to the establishment of a TA. In this context, it must be recognised that the ICAO provision stating "the height above the aerodrome of the transition altitude shall be as low as possible but normally not less than 900 m (3,000 ft)" reflects the operational environment as it existed in the 1950s and early 1960s. The ICAO procedures date from 1958, and were based on the principle that a TA should be as high as required for the purpose of terrain clearance but as low as possible to obtain a common reference (i.e. 1013.2 hPa) for separation purposes for aircraft cruising above the TA.

There were, at that time, several reasons for this principle. One of the important reasons was the lack of air navigation services facilities; some areas of the world did not have the ground based services and facilities to provide current pressure information to en route traffic. Therefore, to accommodate a worldwide application, the provisions that are still applicable today (i.e. the use of QNH for take-off and landing and a standard setting of 1013.2 hPa (QNE) for en route) were adopted in order to obtain a common reference for providing vertical separation during the en route phase of flight.

There are also requirements in Regulation (EC) No 550/2004, and Regulation (EC) No 551/2004 in particular, addressing the need to meet user demands and requirements, and to design and manage airspace in accordance with harmonised rules. The development of an Implementing Rule for HETA could significantly contribute to the achievement of these regulatory requirements.

2.2.1 Mismatch of modern flight profiles with current TAs

The established ICAO provisions have clearly been overtaken by time. Important changes have happened to the ATC operational environment, such as the following:

- The introduction of high-performance aircraft; performance characteristics of modern aircraft are totally different compared to aircraft operated at the time the present ICAO provisions were developed;
- The use of cruising levels are now well above the cruising levels used in the 1950s and 1960s;
- Introduction of standard instrument departure (SID) and standard instrument arrival (STAR) routes; SIDs and STARs often use altitudes as reference (step and stop levels) although part of the SIDs and STARs might be flown above the TA (i.e. in a 'flight level' environment). Consequently, there is a requirement to change the vertical reference when flying on a SID or a STAR that introduces complexity, which in turn also might induce errors;
- The introduction of often complex noise abatement procedures where references are expressed in altitudes;
- QNH values are now automatically available; in European States there is an extensive network of QNH sources and the values are readily available;

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- The fundamentally changed ATC operational environment, without having changed the procedures for the establishment of a TA, results in the requirement to change altimeter settings during the most critical phase of flight when flight deck workload is at its highest. There are a number of examples indicating that this can result in the flight crew omitting to execute the change in altimeter setting, such as:
 - An aircraft climbing to a flight level without changing from QNH to 1013.2 hPa at the TA could result in a loss of vertical separation and, in the worst case, leading to collisions or near-misses;
 - An aircraft descending to an altitude without changing from 1013.2 hPa to QNH at the Transition Level (TL) may not have the required terrain clearance, which, in the worst case, may lead to a controlled flight into terrain (CFIT) accident.

2.3 Current ATM Environment

2.3.1 Multitude of TAs across Europe

In the current ATM environment across Europe, in some cases the TA is lower than obstacles in the area, thus not fulfilling the terrain clearance requirement. Also, a number of States have not coordinated the TA, and the resulting TL, with that of closely spaced adjacent aerodromes, as required by ICAO, resulting in situations where adjacent TMAs may have different TAs.

There is no common methodology for how to determine TAs (i.e. runway based, airport based, TMA based, airspace based, flight rules based etc.). Moreover, the multitude of TAs, some of them not in accordance with the existing ICAO PANS-OPS, results in an operational environment that, from the flight deck's perspective, can lead to confusion that might result in safety critical situations.

The European Action Plan for the prevention of Level Bust (2004) has Recommendation 4.4.2: *Consider establishment of common European transition altitude.* This has, so far, not resulted in any progress in achieving a common European TA.

Other areas such as Australia, North America, Japan, South-East Asia have already established higher harmonised transition altitudes

2.3.2 Future operational procedures

In future, there will be a stronger need for the implementation of high performance and capacity increasing ATM procedures to be able to cope with increasing traffic demand. In many cases, the implementation would be facilitated by the fact that, during these procedures, a change in the altimeter setting will no longer be required because of the higher TA.

2.4 Problem Definition

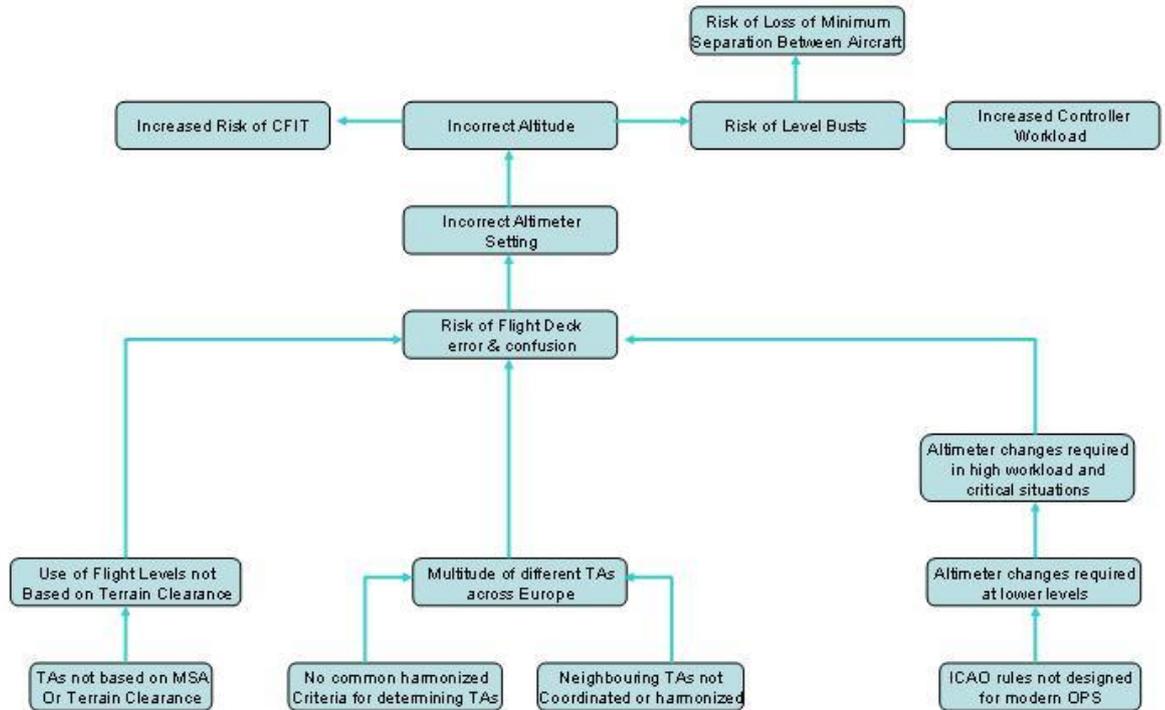


Figure 1: Problem Tree

Figure 1 shows a problem tree for the determination of the problems and causes to be addressed in the scope of the investigation of the feasibility of a HETA. The overarching problem that must be addressed is as follows:

There is potential for confusion and errors on the flight deck, which is caused by the wide variety of TAs used across Europe, the need to change altimeter settings during critical departure and approach phases of flight, and the fact that some TAs do not adequately take into account terrain clearance and minimum safe altitudes. This situation can lead to flights operating at an incorrect altitude and consequently result in an increased risk of loss of separation or CFIT.

A significant factor contributing to this situation is the fact that ICAO provisions for the determination of TAs were written in the late 1950s, and do not reflect modern flight procedures or set out clear and harmonised criteria for setting TAs. Another factor is a lack of coordination of between neighbouring ANSPs and States when determining TAs.

3. policy Objectives

3.1 General Objective

General objectives are the overall goals of a policy and are expressed in terms of its outcome or ultimate impact. If successful, the intervention should at least induce change in the direction of general objectives. For this policy, the general objective is assessed as being the following:

GEN01: To improve safety and efficiency levels associated with the use of TAs across European airspace. This objective shall be achieved without compromising the existing safety levels in any other area.

3.2 Specific Objectives

Specific objectives are the immediate objectives of a policy and are the targets that first need to be reached in order for the general objectives to be achieved. They are expressed in terms of the direct and short-term effects of the policy.

SPEC01: To reduce the degree of risk associated with incorrect setting of the altimeter reference pressure.

SPEC02: To contribute to an increase in the capacity of the European Airspace and the efficiency of operational procedures.

3.3 Operational Objectives

Operational objectives are normally expressed in terms of measurable outputs that the intervention should produce. For this policy, the operational objectives are assessed as being the following:

OPS01: To minimise the number of incidents of loss of separation between aircraft or risk of CFIT caused by incorrect altimeter settings.

OPS02: To minimise the number of occurrences of increased controller/pilot workload arising from incorrect altimeters settings.

OPS03: To move required altimeter reference setting procedures conducted by flight crew to a phase of lower workload (i.e. higher altitude).

OPS04: To facilitate the implementation of high performance and capacity increasing operational procedures.

4. POTENTIAL Policy Options

4.1 General Remarks

Four potential policy options have been considered in this PIA, including maintaining the current 'status quo' situation and three potential regulatory options. These options are briefly described in the sub-paragraphs below.

During the discussions of the HETA Task Force, one of the four options would have been for an Implementing Rule prescribing common criteria for the determination of the TA. Under this option, no specific limit for the TA to be implemented would be prescribed by regulation. However, this option was ultimately considered to be insufficient because, due to its flexible and more generic nature, it would not have paved the way for a harmonised TA, and/or decreased fragmentation in TAs across Europe, nor did it differ significantly from Option 1. Therefore, it was not considered that the effort needed to evaluate the option in full was worthwhile.

For Options 2 and 3, the migration phase is of utmost importance. If all of the EU States/FABs do not implement the requirements at the same time, the potential to provide standard operating procedures in cockpits would be reduced. When considering Options 2 and 3, it is also necessary to differentiate between the impact in a phased implementation as compared to a "big bang" approach. In addition, the short term impacts have to be evaluated as well as the long term implications.

Every State implementing a TA different from current conditions will have to conduct Safety Cases which will present all safety issues, both general and on local constraints, and provide the necessary steps and actions to be taken in order to maintain an acceptable level of safety.

4.2 Option 1 – No Regulatory Intervention (Status Quo)

Option 1 is to take no regulatory intervention on the issue of TAs. European States, under the auspices of the ICAO and EUROCONTROL institutional arrangements, would continue to proceed with, and further evolve, current initiatives without an overarching regulatory requirement being introduced to enforce a particular resolution or approach to the problem.

Nevertheless, this 'Status Quo' scenario takes into account ongoing activities on TA issues at the level of ICAO and Functional Airspace Blocks (FABs), and is the one against which the impacts of the other policy options can be compared and assessed.

4.3 Option 2 – Implementing Rule mandating a HETA at 18,000 ft

Option 2 is to take regulatory action to implement a HETA of 18,000 ft across European airspace.

It should be noted that, in the scope of the work of the EUROCONTROL HETA Task Force, other altitudes were also evaluated. However, the general agreement amongst the airspace experts was that, 18,000 ft was the best candidate. A HETA of 18,000 ft is also in line with IFALPA policy,

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and feedback from some States shows that the 18,000 ft option is the preferred value from airspace users, which should be strongly emphasised. In addition, the preliminary assessments in UK indicate the demand for a significantly higher TA (18,000 ft) to adapt for the challenges in future TMA operations (in a ten-year perspective).

It is foreseen that this regulatory option includes development of an IR and AMC and GM where appropriate.

4.4 Option 3 – Implementing Rule prescribing common criteria for the determination of the TA at or above 10,000 ft

Option 3 is to take regulatory action to establish a commonly accepted set of criteria for the determination of a TA in Europe at or above 10,000 ft, and to prescribe a coordinated approach to be taken by neighbouring States/FABs/ANSPs when establishing TAs and associated procedures. Within this option, ANSPs would maintain some flexibility to consider the local environment, but the prescribed minimum altitude ensures the adaptation of the TA to better reflect preferred flight deck operations.

Compared with Option 2, this approach would not prescribe a specific value for a HETA, only a minimum value of 10,000 ft with generic requirements, complemented by Acceptable Means of Compliance (AMC) and Guidance Materials (GM), where appropriate, for establishing the TA to be used. The regulation to be developed would mandate a harmonised approach and would require States to establish a TA at or above a minimum altitude of 10,000 ft. The AMC/GM would not only pave the way for a harmonised determination of the TA but would also give room for consideration of local constraints. The resulting AMC/GM would not only need to describe the criteria to be applied when determining the TA but also the coordination procedures with adjacent units to be followed during the process.

Potentially, the following details could be contained in the envisaged regulatory material:

1. Binding regulation, through an Implementing Rule, with provisions for each Member State to:
 - a) Establish a single TA at or above 10,000 ft;
 - b) Coordinate within FABs in which the Member State participates;
 - c) Coordinate and establish interfaces with Member States/States providing services in adjacent airspace.
2. Non-binding measures (AMC) to the IR:
 - a) AMC to the Implementing Rule provisions referred to at 1(a) above should, as a minimum, describe the criteria for choosing a certain TA at or above 10,000 ft, Means of Compliance for regional/local QNH measurement and distribution, TL calculation, and consideration of specific geographical and meteorological conditions etc.;
 - b) AMC to the Implementing Rule provisions referred to at 1(b) above should contain a process description on how to achieve the 1(b) regulatory requirements with the aim to agree on a common TA across the whole FAB;

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- c) AMC to the Implementing Rule provisions referred to at 1(c) above should consist of means for establishing interfaces with adjacent airspace, other than the FAB that the Member State belongs to, with the aim to agree on a common TA.

5. Impact Analysis

The HETA Task Force experts considered the potential impact that each option could have on all Stakeholders, and on safety, economic and efficiency aspects, and the environment. The detailed results of the assessments are set out in Annex A.

A summary of the main impacts is provided in the following sub-paragraphs.

5.1 Option 1 – No Regulatory Intervention (Status Quo)

5.1.1 Safety impact

There would be no change to existing safety levels, but the potential risks from non-standardised altimeter setting procedures across European airspace would likely remain. Whilst evolutions in relevant ICAO procedures and initiatives at State/FAB level are already taking place, there would be no assurance about the content and extent of such improvements.

5.1.2 Impact on ANSPs

There would be no requirement for changes to current planning of resources, budgets, and airspace designs, but any voluntary changes to TAs in States/FABs may cause transition issues between ANSPs and a lack of potential to maximise capacity. Also, there could be a perception that ANSPs were not meeting airspace user requirements.

5.1.3 Impact on ATCOs

There would be no requirement for any additional training. However, the workload of TMA controllers associated with new capacity enhancing procedures may be positively impacted if TAs are raised to levels above these procedures.

5.1.4 Impact on flight crew

There would be no requirement for any additional training but the current risks of confusion and errors on the flight deck (caused in particular by the fact that the altimeter reference setting will still have to occur during phases of high cockpit workload) would remain together with the lack of harmonised implementation of TA in Europe.

5.1.5 Economic/efficiency impact

There would be no loss of existing useable flight levels and no additional costs would be imposed on Stakeholders.

5.1.6 Environmental impact

The potential to meet environmental performance targets through an improved use of Continuous Descent Operations (CDOs), as well as high performance departure procedures/CCOs, may not be fully realised.

5.2 Option 2 – Implementing Rule Mandating a HETA at 18,000 ft

5.2.1 Safety impact

Harmonisation would lead to increased flight deck awareness and reduced workload in critical phases of flight. However, it is anticipated that there would be increases in workload from a greater number of aircraft requiring frequent QNH adjustments, and procedures for steep pressure gradients would need to be developed.

5.2.2 Impact on ANSPs

Advantages to ANSPs would accrue from a more predictable and simplified ATM operational environment, and Option 2 would support capacity enhancing TMA procedures and a potential to improve airspace design and transitions between airspace. ANSPs would also be seen to be acting on airspace user requirements. However, the initial effort and budget required by ANSPs to implement significant changes would be high, including the need for training, safety cases, and changes to systems, airspace design and publications. Furthermore, in some areas of Europe, it may not be possible to adopt a HETA of 18,000 ft without incurring significant cost and/or capacity penalties.

5.2.3 Impact on ATCOs

Although the reduction may be limited by the number of QNH adjustments required, it is anticipated that there would be a reduced workload for TMA controllers; however, there would also potentially be increased workload for area controllers providing ATS to aircraft below 18,000 ft, due to need to consider QNH settings and QNH areas. Additional training would also be required for controllers not currently handling changes to altimeter reference settings.

5.2.4 Impact on flight crew

There would be advantages for flight crews from a simplified ATM environment across Europe and a more balanced cockpit workload with a possibility for consistent descent gradients. There would also be a reduced risk arising from the need for flight crew to only make smaller adjustments in altimeter settings, and the fact that there would be more opportunities to detect incorrect settings rather than under the current infrequent and potentially large jumps between different altitude reference settings. However, there would also be a need for more QNH adjustments, which may reduce the aforementioned benefits, and there would be a requirement for new training and changes to SOPs in the short term. Also, flights that normally flight plan to cruise between FL180 and FL200 would have to choose between 18,000 ft and FL210.

5.2.5 Economic/efficiency impact

Although no quantitative costs and benefits data were readily available for assessment in this PIA, it is identified that there will be costs for implementation. However, it is expected that capacity and efficiency improving TMA procedures would be potentially better supported by Option 2, and efficiency levels in TMAs have the potential to increase through the availability of more levels. Nevertheless, depending on the transition plan deployed for Option 2, there could be temporary reductions in capacity if the 18,000 ft TA was not implemented concurrently across

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Europe. Conversely, a single implementation date could cause additional costs related to system upgrades, as current ANSP plans would be affected.

Sector handling around FL180-200 would also be affected, which may especially impact on current sectors using these levels that are already at capacity limits. There would also be a loss of preferred cruising level for some airspace users.

5.2.6 Environmental impact

Through the potential to improve the use of CDOs and CCOs, Option 2 could realise potential environmental benefits of less fuel burn, less CO₂ emissions, and less noise. Preliminary studies conducted in one European State indicate these benefits; however, it has not been possible to quantify these impacts for this PIA.

5.3 Option 3 – Implementing Rule prescribing common criteria for the determination of the TA at or above 10,000 ft

5.3.1 Safety impact

Safety advantages would accrue from the fact that local issues and user requirements would be taken into account, and the number of aircraft requiring frequent QNH changes would potentially be less than under Option 2. However, there could be slightly less overall safety advantages for reducing the risks of CFIT and level busts than under Option 2, because less harmonisation would mean that benefits for flight deck awareness would not be as great.

5.3.2 Impact on ANSPs

Compared to Option 2 there would be similar advantages and disadvantages, but Option 3 would allow ANSPs more flexibility taking into account local constraints. Option 3 would also still provide more certainty than Option 1 for how to determine and coordinate TAs with neighbouring ANSPs. However, there could potentially be a less simplified and predictable ATM environment than under Option 2, because a single TA is not prescribed.

5.3.3 Impact on ATCOs

There would be similar advantages/disadvantages for controllers compared to Option 2. Where a lower TA than 18,000 ft is adopted there will be less aircraft operating on QNH, thereby reducing workload in this respect compared to Option 2. Also, transition issues between different TAs in adjacent airspace would potentially still remain in some areas.

5.3.4 Impact on flight crew

There would be similar benefits compared to Option 2 but these would be reduced as some fragmentation of TAs across Europe may remain.

5.3.5 Economic/efficiency impact

No quantitative cost and benefits data were readily available for assessment in this PIA but costs are expected to be slightly less and easier to plan as compared to Option 2. Also, as TAs would result from a thorough evaluation by the ANSPs concerned, the TAs may potentially better fit requirements and allow the definition of more efficient procedures in some areas compared to Option 2. Unlike Option 2,

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sector handling around FL180-200 would also not necessarily be affected. However, in parts of Europe, if TAs of less than 18,000 ft were selected, the positive impact on efficiency resulting from improved TMA procedures would be smaller than under Option 2, and this may also adversely impact the design of efficient flight profiles.

5.3.6 Environmental impact

Taking local constraints and procedures into account when defining a TA would give room for improving flight profiles to take account of environmental benefits. However, if a TA is selected at a lower altitude than 18,000 ft, it may prevent the optimisation of flight profiles, thereby limiting the environmental advantage compared to Option 2.

6. Comparison of options

6.1 Introduction

A qualitative comparison of the potentially valid policy options was conducted to weigh the various positive and negative impacts of the proposals. The overall aim of this comparison was to assist in the forming of clear recommendations, and associated rationale, for policy-makers. To achieve this comparison, multi-criteria analysis was chosen as the most appropriate tool.

A detailed description of the design, conduct and specific results of the multi-criteria analysis used in this PIA is set out in Annex B.

6.2 Individual Assessment of the Options

The individual assessments in the multi-criteria analysis at Annex B reflect the following views of the HETA Task Force.

6.2.1 Option 1 - No Regulatory Intervention (Status Quo)

Maintaining the 'status quo' would be the cheapest of the three studied options because changes from current plans for TAs in States and FABs would not be enforced through regulation. For similar reasons, it would be the easiest choice.

Allowing States and FABs to focus purely on their current, own TA plans would not be consistent with the aims of the SES initiative to harmonise airspace and procedures throughout the EU. Without regulation, it is expected that current plans for FABs across Europe could move TAs towards less fragmentation but this is by no means certain and the overall effect may not be significant.

Current plans for TAs in States and FABs may eventually result in isolated achievement of some aims of the operational policy objectives, and specifically a reduction on flight crew workload in some areas of EU airspace. However, without regulatory intervention, this is not certain and benefits would be minor.

Different Stakeholder groups are expected to have polarised opinions about maintaining the 'status quo'. A lack of EU intervention on this long-standing issue is not expected to be acceptable to airspace users, but some States and ANSPs are thought not to prefer regulation..

6.2.2 Option 2 - Implementing Rule mandating a HETA at 18,000 ft

Mandating the adoption of a specific harmonised TA across European airspace could achieve all the policy objectives and would be wholly in accordance with the aims of the SES initiative. Although it has not been possible to provide tangible evidence, it is expected that Option 2 will provide very useful benefits for safety and capacity.

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Enforcing a specific harmonised TA would present considerable implementation challenges, particularly in some States, which would be difficult to overcome. Furthermore, linked to this aspect, this is thought likely to be the most costly option to implement. Option 2 is expected to be the most favourable for airspace users but the least favourable to most States and ANSPs.

6.2.3 Option 3 - Implementing Rule prescribing common criteria for the determination of the TA at or above 10,000 ft

Option 3, with its embedded flexibility, is expected to be an acceptable option with the majority of Stakeholder sectors, and it would realise aims of improved harmonisation and the raising of TAs in Europe, albeit to a slightly lesser degree than Option 2.

Similarly, Option 3 is expected to be costly and challenging to implement, although to a lesser degree than Option 2.

It is considered that all the policy objectives could be met by Option 3, but there would be slightly less certainty in this regard when compared to Option 2.

As the most flexible of the regulatory options, allowing greater account to be taken of local circumstances, it is expected that Option 3 would be the most acceptable, overall, to Stakeholders.

6.3 Comparative assessment of the options

When comparing the overall relative advantages and disadvantages of the three options, the results of the multi-criteria analysis at Annex B reveal the following issues.

6.3.1 Comparison of Option 2 against Option 1

The overall 'un-weighted' assessment appears to indicate that maintaining the 'status quo' could be marginally more favourable than firm regulatory action mandating a specific TA for the whole of EU airspace. However, the overall results of the 'un-weighted' assessment are close and, therefore, could be considered to be too sensitive to able to draw any firm conclusions. Nevertheless, the preference for Option 1 over Option 2 is then further confirmed by the 'weighted' analysis, even though achievement of the objectives is considered to be the most important criteria and Option 2 would be the most successful approach in that regard.

When comparing Option 2 against Option 1 in the short and long term, the results highlight that Option 2 would be costly, less acceptable to most States and ANSPs and the most challenging to implement in the short term, but that the longer term benefits of Option 2 would significantly outweigh those for Option 1. Moreover, Option 2 is consistent with the aims of SES, whereas Option 1 is unlikely to be so.

On balance, it is considered that the analysis highlights that the costs and disadvantages associated with Option 2 outweigh the benefits compared to maintaining the 'status quo', particularly in the short term. However, if mitigation for costs and local issues could be found for the short term,

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Option 2 could be considered as a long-term goal through suitable transition measures.

6.3.2 Comparison of Option 2 against Option 3

The overall 'un-weighted' assessment appears to indicate that Option 3 would be more favourable than Option 2. This preference is then more apparent in the 'weighted' analysis.

Compared to Option 2, the more flexible Option 3 could be less costly, more acceptable to the majority of Stakeholders and easier to implement. Furthermore, Option 3 can be considered as almost as consistent with the aims of the SES policy as Option 2 which; however, would be marginally more likely to achieve all of the policy objectives.

On balance, it is considered that the comparative analysis highlights that Option 3 could provide a more appropriate, and pragmatic, regulatory solution than Option 2 for the problems associated with TAs across Europe, particularly in the short term.

7. CONCLUSIONS

As can be seen from the detailed impact assessment (see attachment B), the HETA TF has studied in detail all the various impacts from all angles, highlighting a significant number of advantages and disadvantages of the three options chosen. Nevertheless, this is a preliminary assessment and in the further steps issues like the implementation cost and the relationship between a 'big bang' approach for implementation and the established plans of ANSPs need to be further analysed. Without more detailed information on these important issues, this PIA and the comparison of the options evaluated does not yet allow the Task Force to draw a firm conclusion as to whether the problems described above are best solved with or without a regulatory intervention.

In addition to Option 1 (i.e. no regulatory activity), a comparative assessment of two potential regulatory options has been assessed during a PIA process on the harmonisation of TAs in European airspace. As a result of this, the following conclusions were reached:

- Whilst developing an Implementing Rule to prescribe a HETA of 18,000 ft (Option 2) appears to be less favourable than maintaining the 'status quo' (Option 1) because of short term costs and implementation challenges, and because it seems unlikely to achieve consensus across Stakeholder groups. It would also not be possible to implement this Option without significant potential cost and/or capacity impacts in certain areas of Europe. However, this regulatory option is the one most consistent with the overarching objectives of EU policy and Regulations.
- Developing an Implementing Rule to prescribe common criteria for the determination of TAs at or above 10,000 ft (Option 3) appears to be more favourable than maintaining the 'status quo' (Option 1) and could provide a more pragmatic regulatory option than a single HETA, particularly in the short term. This option would provide States and ANSPs with more flexibility, it could be less costly than implementing a single HETA at 18,000 ft (Option 2), and it could be more acceptable to the majority of Stakeholders. It should achieve most of the policy objectives, although it will not ensure the same level of harmonisation as Option 2.

Even without a regulation, under the 'Status Quo' scenario some implementation of higher TAs would take place. However this would be on a non-harmonised basis and fragmentation will continue to exist. Therefore, airspace user requirements to reduce workload during critical phases of flight and reduce the probability of errors during critical procedures, would not be fully met.

Nevertheless, the results of the multi-criteria analysis were very close and, therefore, gaining wider Stakeholder views and quantitative data on costs would be useful for confirming the results of this PIA. Additionally, although the feasibility study for the Nordic States has already considered military aspects, the impact on the military needs to be further investigated.

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In summary, based on the weighted analysis (Annex C, paragraph 2.3) where the options were ranked in order: Option 3; Option 1; Option 2, the HETA TF drew the following conclusions:

1) Developing an Implementing Rule to prescribe common criteria for the determination of TAs at or above 10,000 ft (Option 3) appears to be more favourable than maintaining the 'status quo' (Option 1) and could provide a more pragmatic regulatory option than a single HETA, particularly in the short term;

2) Although the results of the multi-criteria analysis do not provide big differences between the options, it can be deducted that, because of short term costs and implementation challenges, the development of an Implementing Rule to prescribe a HETA of 18,000 ft (Option 2) appears to be less favourable than maintaining the 'status quo' (Option 1);

3) Feedback should be requested from a wider range of stakeholders on the three options evaluated and to collect quantitative data to confirm the results of this PIA.

8. RECOMMENDATIONS

It is recommended that:

- Regulatory action to prescribe common criteria for the determination of TAs at or above 10,000 feet should be the preferred option for harmonisation of TAs in European airspace.
- Wider views of Stakeholders, including the impact on military operations, and additional quantitative data should be sought as a next step in order to confirm the findings of this PIA.

ANNEX A

DETAILED IMPACT ANALYSIS

Option 3 is expected to deliver the same benefits and disadvantages as option 2 but to a lesser extent. In case of specific advantages or disadvantages compared to one of the other options, this is explicitly stated in the respective table itself.

A.1 Safety Impact

Note: most of the elements hold a safety relevance, only some more specific ones are highlighted below.

Option 1	Option 2	Option 3
SAFETY ADVANTAGES/BENEFITS		
No change in current safety levels with reference to this issue	A common, harmonised ATM environment would improve the overall safety and a common TA supports a harmonised ATM environment	Compared to option 1 a harmonised environment resulting from a common set of requirements will lead to a lower risk of altimeter mis-settings reducing the risk of loss of separation and CFIT.
	A common TA would improve flight crew awareness of the environment they are operating in, i.e. potentially reduce the number of mis-settings of altimeter thereby potentially reducing the number of level busts	If the TA is set at a lower altitude as compared to option 2, the number of flights affected by the changes of QNH will be lower.
	A higher TA would displace the required action by flight crews to change reference system altimeter setting from immediately after departure to an altitude above the level band where flight deck workload is at its highest	A TA determined within the common set of requirements (rather than one value being prescribed by regulatory action), ensures that it considers all local constraints.
	A common TA would allow for a better integration of the altimeter setting into flight deck procedures for European airspace	Compared to option 1 a minimum TA of 10,000 ft takes into account concerns raised by airspace users.

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Option 1	Option 2	Option 3
	<p>Frequent updates by ATS of current QNH to be used (shift between area QNH and/or change from area QNH to local QNH) may reduce the possibility of pilots forgetting to set the correct QNH and/or change from QNE/QNH and vice versa.</p>	
	<p>A higher TA has the potential to reduce the risk of CFIT through addressing the situation where TAs are set to be below minimum safe altitude requiring pilots to set QNE on one altimeter and QNH on the other in order to ensure terrain clearance expressed in vertical distance above minimum safe altitude while aircraft are expected to fly using flight levels.</p>	
	<p>The altimeter reference provided by ATS will ensure that all aircraft operating in the sector/QNH-area below 18,000 ft will be on a safe reference (provided that pilots in descent actually changes from standard) There will be a larger and consequently safer buffer from 18,000 ft and down to discover potential situations where pilots forget to change, than from a low TA where the situation could lead to a potential CFIT</p>	
	<p>A higher TA has the potential to reduce the risk of airspace infringements through having all flights below 18,000 ft on one reference system only.</p>	
	<p>Since it is expected that occasions of wrong altimeter setting between the different reference systems will be reduced, there is a possibility for lower workload</p>	
	<p>A higher TA will eliminate the possible changes of reference (changes between QNH and QNE) in high workload situations as in missed approaches and/or re-clearances for new approaches or level-offs. This becomes even more important in emergency situations.</p>	

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Option 1	Option 2	Option 3
	<p>Small altimeter adjustments because of variations in the QNH value are considered as safer than one single change between QNE and QNH for the following reasons:</p> <ul style="list-style-type: none"> • A small adjustment can be fit into the flight deck procedures easier than a big change; • Multiple small adjustments provide numerous opportunities to detect and correct a wrong setting; • If only small adjustments have to be made, the risk for a gross mis-setting is smaller 	
SAFETY DISADVANTAGES/COSTS		
<p>There will continue to exist significant variations in the value of the TA, but also in respect of procedures related to the establishment of TAs and TLs, and it is universally accepted by safety experts that non-standard procedures constitute a safety risk</p>	<p>Increases the number of flights that will be subject to QNH adjustments (i.e. all flight below 18,000 ft including new QNH in a sector and consequent requirement for read back of QNH).</p>	<p>Compared to option 2 and if the TA is defined at a lower altitude, the positive effect on the risk of CFIT incidents will be reduced.</p>
<p>Maintains the operationally unsatisfactory situation of today where the current diversity in TAs is considered by IFALPA to have a negative impact on safety</p>	<p>Procedures for steep pressure gradients need to be developed</p>	<p>Compared to option 2 and if the TA is defined at a lower altitude, the positive effect on reducing the risk of level busts due to pilots forgetting to change the altimeter setting in critical phases of flight will be less because then the number of altimeter settings taking place during specific operational procedures will in many cases be higher than if the TA is set at 18,000 ft.</p>
	<p>Since occasions of wrong QNH setting in airspaces below the higher TA (shift between area QNHs and/or change from area QNH to local QNH) will be increased, there is a possibility for higher workload</p>	<p>Since it is unlikely that a single value for the European TA will be achieved, you will get the benefits of standardisation to a lesser degree</p>

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A.2 Impact on the Air Navigation Service Providers

Option 1	Option 2	Option 3
ADVANTAGES/BENEFITS FOR AIR NAVIGATION SERVICE PROVIDERS		
No need for resources/budget forced to being spent by States/ANSPs on changes related to the value of the TA	Providing more predictable operational environment across areas of responsibility allowing for a coordinated and cooperated change process, giving benefits to involved stakeholders	By not prescribing a single value for the European TA, ANSPs gain some flexibility in determining the TA potentially maximising benefits and allowing consideration of local restrictions
No need to adapt airspace design and working methods to cater for the implementation of a higher TA	A TA at 18,000 ft, in most cases, supports the introduction of capacity improving TMA procedures	Compared to option 1, common criteria for the determination of the TA will ease the coordination between ANSPs and facilitate reaching agreements.
	<p>Considering planned developments (such as the move towards FABs), a move to a common TA at 18,000 ft may introduce possibilities to improve and harmonise current airspace design.</p> <p>No need for establishment of transition arrangements between areas of different TA values.</p> <p>Specific actions such as the establishment of unidirectional routes, the defining of transition airspace, the introduction of increased vertical separation between areas of different TA values does not need to be considered in case of a coordinated move to a common TA</p> <p>Depending on the levels normally used in holding patterns, TA at 18,000 ft may be an advantage because it minimises the mix of flight levels and altitudes in holding</p> <p>SIDs and STARs can be designed to better allow for uninterrupted descents and climbs</p> <p>The move to a harmonised TA of 18,000 ft may facilitate the centralised development of training material thereby reducing effort and costs .</p> <p>A standardised TA will partly contribute to a simplification of the ATM environment.</p>	

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Option 1	Option 2	Option 3
DISADVANTAGES/COSTS FOR AIR NAVIGATION SERVICE PROVIDERS		
<p>Since it is anticipated that some States/ANSPs/FABs will implement a higher TA, transfers between areas of high and low TA need to be addressed, and solutions developed, including:</p> <ul style="list-style-type: none"> • transition areas between areas of low and high TA • unilateral routes • increased vertical separation 	<p>The TA is an integral part of airspace design and operational procedures. It therefore follows that a move of the TA up to 18,000 ft will require effort/budget to adapt the existing airspace design and related procedures, resulting in the requirement for ANSPs to address, inter alia, the following:</p> <ul style="list-style-type: none"> • altimeter setting procedures and the definition of QNH areas, including transition between such areas • Transfer of control points and levels may need to be adjusted in cases where flight levels 180 – 200 are used. ANSPs need to: • existing sectorisation, which may involve simulations to assess: • links between airspace design and QNH areas; • impact on any existing delegation of airspace; • impact on special activities airspace and cross border procedures. 	<p>A mechanism has to be put in place and administered to validate the approach of the members state/FAB to decide on the TA against the common criteria.</p>
<p>Could be seen as not acting upon clearly expressed user requirements</p>	<p>Depending on the levels normally used in the holding patterns, 18,000 ft may in some cases introduce a disadvantage because it could increase the instances of a mix of flight levels and altitudes in holding. This applies as well to capacity enhancing TMA procedures such as point merge in case they take place at 18000 ft.</p>	<p>Because of the flexibility in this approach, there is a risk that, due to local considerations the fragmented situation remains although potentially to a lesser degree.</p>
<p>Making the introduction of capacity improving TMA procedures, such as CDAs, High performance SIDs and Point Merge more complex through pilots having to change between reference settings in the middle of those procedures.</p>	<p>There is a requirement to define authorised sources for providing QNH, address legal implications of using QNH sources from other States and define procedures for how to choose a regional QNH from all available sources</p>	<p>Not harmonising at a single TA value the member state/FAB is perceived as not fully acting upon clearly expressed user requirements</p>
<p>Not in line with the recommendation from “The European Action Plan for the prevention of Level Bust”</p>	<p>Requirements for how often QNH should be provided need to be established, the impact of steep pressure gradients and issues related to the delivery of QNH values to crews, communication methods and frequency including contingency procedures needs to be addressed</p>	<p>Not in line with the recommendation from “The European Action Plan for the prevention of Level Bust”</p>
	<p>Training requirements, including human factors issues, will have to be addressed, including the possible need for simulation</p> <p>Safety assessments at national and possibly FAB levels need to be conducted</p>	

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Option 1	Option 2	Option 3
	<p>System implications have to be addressed, providing effort/budget to make sure systems are able to provide ATCO with required information. This includes addressing, inter alia:</p> <ul style="list-style-type: none"> • MET inputs (hardware/software changes as required to retrieve selected QNH sources, and for data gathering, processing, presenting and updating) • QNH display system • RDPS changes (new FL/altitude division) • FDPS changes • number of QNH areas • ETFMS links • other tools as identified • barometric warning tool <p>The time required to address these system changes may vary from ANSP to ANSP, and all ANSPs should assess the time required to enable the system changes and report to the regulator for a decision on the national implementation plan</p> <p>Publications and/or national laws will need to be amended, such as:</p> <ul style="list-style-type: none"> • The change will have an impact on AIS publications including maps and charts, and there will be a need to amend ENR 1.7, ENR 2.1.2, ENR 2.1.3, ENR 3.1, ENR 3.3, AD 2.17 and charts in AD 2.24 (also take into account the Aeronautical information regulation and control (AIRAC) cycle) (The change of TA on some charts may be solved by use of NOTAM until first regular update of the charts) • There is a need to issue aeronautical information circular (AIC) well in advance, to amend letters of agreement (LoAs), to consult chart providers and commercial providers of AIS • ICAO documentation needs to be considered, in particular Doc 7030, and there may be a need to develop amendment proposals to ICAO global provisions. • Operational manuals and LoAs will have to be amended to accommodate and operationally deploy the change at the ops level <p>The interfaces to the airspace outside the harmonised area will have to be defined.</p> <p>Under special meteorological conditions, such a steep pressure gradients, the application of a harmonised TA and the associated QNH procedures may prove to be not feasible.</p>	

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A.3 Impact on the Air Traffic Controller

Option 1	Option 2	Option 3
ADVANTAGES/BENEFITS FOR AIR TRAFFIC CONTROLLERS		
No need for additional training or amendment to established procedures	No need for intervention by controllers providing separation to aircraft transiting between areas of different reference setting systems, i.e. when one State has a high TA and the neighbouring State have a low TA.	Compared to option 1, in some cases, common criteria resulting in a more harmonised situation across member state boundaries, potentially makes coordination of cross border traffic easier.
	There is no requirement for the development of additional ATC procedures	Compared to option 1, common criteria resulting in a more harmonised situation with regard to the TA, will result in a decrease of level busts because of cockpit errors resulting in lower controller workload
	Within all sectors (and/or QNH-areas) below 18,000 ft all traffic will most probably be on the same reference.	Since the number of aircraft that have to be supplied with the QNH-value (including read-back) potentially is lower reducing controller workload.
	Within the TMA removing consideration of the TA from ATCOs has the potential to significantly reduce workload <ul style="list-style-type: none"> • No loss of Holding levels due to changing Minimum Stack Levels • Minimum TMA overflying levels do not change • A higher TA creates a more stable operating environment. 	
	Descent gradients are consistent because no change of reference setting within TMA airspace (e.g. changing from 1013Hpa to 993Hpa at 6000' putting aircraft approximately 600' off the planned gradient). This helps with CDO, RNAV Arrivals and descent planning from hold to IAF.	
DISADVANTAGES/COSTS FOR		
With the establishment of new capacity increasing and environmentally friendly TMA procedures the complexity for the ATCOs work will potentially increase. This complexity is further increased if within these procedures also the change of the altimeter setting will have to be considered.	Controllers operating in airspaces below 18,000 ft will have to take boundaries of QNH areas (altimeter setting regions) into account, and ensure the accurate provision of area and/or local QNH so that separation is ensured: <ul style="list-style-type: none"> • between traffic inside a QNH area, • between traffic passing from one area to another, and • when transiting from area QNH to local QNH and vice versa 	Compared to option 1, a modification of the TA because of the new guidelines and the resulting modification in the airspace design will potentially result in changing ATC operational procedures

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Option 1	Option 2	Option 3
<p>TA in the lower band (i.e. 3,000 ft to 7,000 ft region) will ensure continuation of all the negative aspects, i.e. greater potential for CFIT and level busts, loss of available FLs in TMAs, more workload and unnecessary burden for TMA controllers especially in heavy traffic situations to keep focus on the correct altimeter reference to be used for every single aircraft</p>	<p>Controllers that today do not handle the change between the two reference systems will require training. This change in tasks may reduce capacity in these sectors and increase the workload.</p>	<p>Compared to option 1, if a new TA will be defined but is not harmonised across the state borders existing cross border coordination procedures have to be modified and Air Traffic Controllers have to be trained</p>
	<p>The broadcast of the changed area QNH including the required read-back will have negative impact on the controller workload.</p> <p>Increases the number of flights that will be subject to QNH adjustments (i.e. all flight below 18,000 ft including new QNH in a sector and consequent requirement for read back of QNH). This includes all flights, no matter whether cruising, climbing or descending.</p> <p>May create additional complexity in the vicinity of major TMAs where traffic on area QNH have to be separated from traffic operating on local QNH (in those situation where the area QNH is not the same as the local QNH)</p>	

A.4 Impact on the Flight Crew

Option 1	Option 2	Option 3
ADVANTAGES/BENEFITS FOR FLIGHT CREW		
No change will not require any additional training	Standardised TA will contribute to a simplification of the ATM environment.	Compared to option 1 a more harmonised environment potentially reduces the risk of altimeter setting errors and consequently the risk of loss of separation or CFIT.
	<p>A common and higher TA has the potential to provide for a more balanced cockpit workload, through</p> <ul style="list-style-type: none"> • introducing the possibility to develop standardised cockpit operating procedures for the change between reference systems, and • avoiding that the change between different reference systems to take place during workload intense phases of departure and arrival. 	Compared to option 1, since the resulting TA will be definitely located above the minimum value and higher than in today's environment, the setting of the altimeter will be moved to less critical phases of flight reducing the cockpit workload
	Eliminates the operationally unsatisfactory situation of today where the current diversity in TAs is considered by IFALPA to have a negative impact on safety	Compared to option 1, moving the altimeter setting to less critical phases of flight will reduce the risk of mis-setting the altimeter
	The establishment of a standardised 18,000 ft TA will be in line with IFALPA policy, and requirements in EC Regulation 550/2004 and 551/2004 in particular, addressing the need to meet user demands and requirements, and design and manage airspace in accordance with harmonised rules.	Compared to option 1, a harmonised TA environment allows to better harmonise operating procedures.
	Below 18,000 ft all traffic will be on the same reference, ensuring that pilots only have one reference to relate to.	Compared to option 1 criteria resulting in the establishing of a higher TA have the potential to result in more streamlined procedures such as STARs, SIDs, CDOs, CCOs and holdings for which a change in altimeter setting might no longer be required.
	All traffic operating below 18,000 ft will obtain the QNH to be used, and changes thereof, ensuring they operate (provided they change when supposed to) on a safe reference in regard to terrain clearance and separation between aircraft.	Compared to option 1 criteria resulting in establishing more standardised and higher TAs is more in line with IFALPA policy, and requirements in EC Regulation 550/2004 and 551/2004 in particular, addressing the need to meet user demands and requirements, design and manage airspace in accordance with harmonised rules.
	Descent gradients are consistent because no change of reference setting within TMA airspace (e.g. changing from 1013Hpa to 993Hpa at 6000' putting aircraft approximately 600' off the planned gradient). This helps with CDA, RNAV Arrivals and descent planning from hold to IAF.	Compared to option 1, the possibility of multiple en-route altimeter adjustments for all flights operating below a raised TA will provide more update and focus on the correct altimeter reference to be used by pilots, potentially reducing level busts and wrong settings of QNH.

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Option 1	Option 2	Option 3
	<p>For the flight crew the change between different altitude reference systems is considered more significant than the adjustment between small variations of the QNH value. These adjustments constitute a smaller risk than the changes.</p> <p>Because altimeter adjustments will happen more frequently than the change from QNE to QNH there are more opportunities to detect and correct a wrong altimeter setting.</p> <p>Frequent small adjustments reduce the risk for gross mis-settings.</p>	<p>Compared to option 1, a larger number of flights or a bigger portion thereof will be performed under QNH settings. The fact that these settings are subject to small adjustments rather than one big change when transiting from QNE to QNH or vice versa is considered by flight crews to be safer?</p>
DISADVANTAGES/COSTS FOR FLIGHT CREW		
<p>There will continue to be SID/STARs with terrain constraints expressed in QNH while the flight is still required to be flying on standard setting (above the TA)</p>	<p>Passing of multiple sectors with different QNH below TL may introduce additional adjustments to altimeter setting after passing TL, minimising the positive effect of not having to change the altimeter in the critical phases of flight</p>	<p>Since no common harmonised TA has been mandated, a fragmented TA environment may continue to exist and procedures may differ in different areas.</p>
<p>Flight crews will continue to be subjected to non-harmonised procedures</p>	<p>Flights that normally flight plan to cruise between FL 180 – 200 will have to choose between 18,000 ft and FL210</p>	<p>Potentially a larger number of flights or a bigger portion thereof may be performed under QNE settings. The advantage of the smaller adjustments of the altimeter setting rather than the single action of the change between QNH and QNE (and vice versa) is lost for those flights</p>
<p>Flight crews will have to execute the change between different reference systems at the time when cockpit workload is at its highest</p>	<p>Training requirements will have to be addressed</p>	<p>Not harmonising at a single value could be seen as not fully acting upon clearly expressed user requirements</p>
<p>Maintains the operationally unsatisfactory situation of today where the current diversity in TAs is considered by IFALPA to have a negative impact on safety</p>	<p>A modification to the TA may have an influence on the SOP because some SOPs are designed to include altimeter information.</p>	
<p>Pilots forgetting to change from QNE to QNH at low altitudes can create critical situations in regard to CFIT.</p>		

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A.5 Economic and Efficiency Impact

Option 1	Option 2	Option 3
ECONOMIC AND EFFICIENCY ADVANTAGES/BENEFITS		
No potential loss of FL for Area controllers between 18,000 ft and FL 210.	A TA at 18,000 ft will support the introduction and further development of capacity and efficiency improving TMA procedures , such as <ul style="list-style-type: none"> • CDAs; • High performance SIDs; and • Point Merge. 	Since the TA will be result of a thorough evaluation by the ANSPs concerned (rather than prescribing a single value) for some cases it potentially better fits the requirements and allows the definition of more efficient procedures.
No investments for new related technological, organizational and procedural implementations.	The efficiency in the TMA has the potential to increase through the availability of more levels	In some areas where a loss of levels in the area between FL180 and FL 210 cannot be afforded (like in the alpine region) option 3 allows to set the TA at a different, more convenient level. This will allow to minimise the impact on capacity and efficiency.
ECONOMIC AND EFFICIENCY DISADVANTAGES/COSTS		
Making it more difficult to reach the full potential from the introduction of capacity improving TMA procedures, such as CDAs, High performance SIDs and Point Merge through having the change between reference settings in the middle of those procedures.	During the implementation phase we may experience a situation of a temporary capacity reduction. The extent of this reduction very much depends on whether the implementation will be performed in a “big bang approach” or in a phased approach.	If the TA is selected at a lower altitude than 18,000 ft, the positive impact on efficiency resulting from improved TMA procedures will be smaller.
Loss of a FLs in a busy TMA environment (i.e. with a TA in the 3,000 ft to 7,000 ft region and especially for TMAs with limited upper limits) will potentially create a burden for controllers, and result in an inefficient flow of air traffic.	Different States have different plans as regards system upgrades which will be affected by a decision on one single implementation date and thereby introduce additional cost.	If the TA is selected at a lower altitude it may impact the design of efficient flight profiles limiting the economic advantage.
	<p>The complex flight level allocation scheme will require a review, with possible negative impact on efficiency of operations.</p> <p>The implementation of a European wide TA at 18,000 ft will have a significant impact on systems and resources, especially during the planning and implementation phase.</p> <p>In sectors handling flights in levels around FL180-200 the efficiency may have the potential to decrease which in some cases already may be bottlenecks</p> <p>For certain aircraft operators such a change will result in the loss of their preferred cruising level.</p>	

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Option 1	Option 2	Option 3
	In sectors handling flights at levels around FL180-200 the efficiency may have the potential to decrease. This will most severely affect sectors that are now already working at their capacity limit.	

A.6 Environmental Impact

Option 1	Option 2	Option 3
ENVIRONMENTAL ADVANTAGES/BENEFITS		
Environmental impact not quantified.	A common TA at 18,000 ft may support meeting environmental performance targets through its potential to improve the use of CDAs, as well as high performance departure procedures. Through ensuring optimal flight profiles, the environmental effects will be less, including less fuel burn, less CO ² emissions, and less noise.	Taking the local situation and procedures into account when defining the TA will give room for improving the flight profiles resulting in environmentally positive results.
ENVIRONMENTAL DISADVANTAGES/COSTS		
By not introducing a common TA at 18,000 ft the possibility to support meeting environmental performance targets through an improved use of CDAs, as well as high performance departure procedures will be reduced. Therefore the positive environmental effects will be less.	Environmental impact not quantified.	If the TA is selected at a lower altitude it may prevent the optimisation of flight profiles limiting the environmental advantage.

ANNEX B

MULTI-CRITERIA ANALYSIS

Within the EUROCONTROL HETA Task Force, experts agreed on a set of evaluation criteria with which the merits of the individual options can be assessed subjectively. These are described in paragraph B.1 below, and they were specifically chosen to tease out the most important attributes of the options that need to be taken into account.

The initial part of the analysis involved the use of a pre-defined 'scoring' system set out in a taxonomy to assess the merits of the options against each of the evaluation criteria. This was conducted using the expert judgement of the HETA Task Force members. Within the multi-criteria analysis, there was also a need to reflect the fact that some positive and negative impacts may potentially be of more importance than others. Therefore, a simple comparative 'weighting' system with which to assign relative importance to the individual evaluation criteria was also devised to provide an additional, subsequent 'layer' of analysis. The scoring taxonomies are set out in paragraph B.2.1 below.

The results of the evaluation, set out in paragraphs B.2.2 and B.2.3 below, reflect the overall agreement of the HETA Task Force experts on the basis of currently available information.

It should be noted that all scoring is based on a comparison of an option against the other options, and so it reflects a relative score rather than absolute values.

B.1 Comparative Analysis Criteria

Together with the members of the HETA Task Force, evaluation criteria were developed to allow a qualitative comparison the options in order to come to a ranking.

B.1.1 Consistency With the Aims of the European Union Policies and Regulations

With this criterion, an assessment needs to be made of the extent to which the individual options are consistent with the overarching objectives of the European Union Policies and Regulations, such as harmonisation, capacity, etc.

B.1.2 Relative Costs

This criterion provides a means to compare the expected costs of implementation of each of the options compared to the others. The result will be an indication of the relative costs of an option and not an indication of the absolute cost to be expected.

The intention of this criterion is to provide an indication of the relative costs of the individual option related to systems implementation etc. (i.e. hardware & software). However, it should be noted that there is no relevant, existing cost-benefit data available for consideration in this PIA. Therefore, in this case, the comparative assessment of costs is a purely qualitative exercise using the expert judgement of the HETA Task Force members.

B.1.3 Achievement of Objectives

A key measure of the capability of the potential options to overcome the identified problem is the extent to which the options are likely to meet the policy objectives.

Therefore, the likely effectiveness of each of the policy options in achieving the Specific and Operational Objectives, as identified in section 3 of this PIA, needs to be considered. In essence, this criterion provides a qualitative assessment of the main benefits of the options.

B.1.4 Ease of Operational Implementation

In association with the technical means of implementing the potential policy options, suitable operational procedures will be essential for ensuring the success of any solution that is adopted. This will, particularly, be the case at the interface of different technical solutions and systems where a multi-tiered or evolutionary strategy is adopted. Therefore, the ease with which new operational procedures can be introduced will be a key factor for ensuring success, and an appropriate assessment must be made for each of the potential policy options.

The intention of this criterion is to provide an indication of the relative cost of the individual option related to human and procedural aspects (such as training, airspace design, documentation, etc.).

B.1.5 Likelihood of Stakeholder 'Buy-In'

The eventual adoption of any of the policy options, and the likely success that an option may have in overcoming the identified problem, will be highly dependent on the support and investment that Stakeholders, and particularly ANSPs, are willing to provide. Therefore, a key criterion for comparing the impact of the options was considered to be the likelihood of Stakeholders 'buying-in' to the proposals. In essence, this criterion could be considered as a measure of the foreseen 'political acceptability' of an option.

B.2 Comparative Analysis

B.2.1 Evaluation of the Options

Qualitative expert views on the impacts of the various options against the evaluation criteria were captured in a structured and harmonised manner to provide, as far as practicable, consistent and reliable results. In addition, a simple scoring system was used to facilitate an element of quantitative assessment with which to aid the final analysis of the qualitative thinking. To achieve this, each of the proposed options was individually 'scored' against each of the aforementioned evaluation criteria. A supporting taxonomy was designed for this purpose, which facilitates the allocation of scores from 1 to 5. The taxonomy used for the scoring system is shown in Table 1 below.

As a first layer of analysis, the HETA Task Force experts used the taxonomy to allocate a score of 1 to 5 for each of the options against each of the evaluation criteria. Scores at half point intervals were permitted where the experts felt that an option lay somewhere between the taxonomy descriptors for the evaluation criteria. This initial layer of analysis was conducted on the assumption that all the evaluation criteria are of equal importance. There was also no 'ranking' element to this first analysis layer, which meant that the same 'score' could be assigned to different options under the same evaluation criteria.

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Criteria	Consistency with the Aims of the EU Policies and Regulations	Relative Costs	Achievement of Objectives	Ease of Operational Implementation	Likelihood of Stakeholder 'Buy-In'
Score					
1	Only isolated and/or minor benefits could be realised with respect to the implementation of the EU policies and Regulations	Very high costs relative to the other options	None of the objectives are likely to be met	Very difficult operational implementation issues to overcome	Likely to attract no support from Stakeholders
2	Useful wider benefits could be realised with respect to the implementation of the EU policies and Regulations	High costs relative to the other options	Unlikely to meet all the objectives	Difficult operational implementation issues to overcome	Likely to attract only isolated support
3	Useful wider benefits will be realised with respect to the implementation of the EU policies and Regulations	Medium costs relative to the other options	Could possibly meet all the objectives	Operational implementation should be broadly straightforward	Likely to attract an even split of those for and against the option
4	Very Useful wider benefits will be realised with respect to the implementation of the EU policies and Regulations	Low costs relative to the other options	Will probably meet all the objectives	Easy operational implementation	Support from the majority of Stakeholders expected
5	Implementation of EU policies and Regulations will be significantly enhanced	Very low costs relative to the other options	Will definitely meet all the objectives	Very easy operational implementation	Full support of all Stakeholders expected

Table 1: Taxonomy Applied for the Qualitative Analysis of the Options Against the Criteria

In order to then further refine the overall comparative analysis of the options, a second layer of analysis was applied to the scores assigned during the first layer. To achieve this, a simple 'weighting' mechanism was applied to the evaluation criteria in order to take account of the fact that some of the criteria could be considered as being more important others. Therefore, the HETA Task Force expert views were

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also obtained on what 'importance' should be afforded to the individual evaluation criteria. The taxonomy shown in Table 2 below was designed to support this 'weighting' process through the allocation of a simple score from 1 to 5 against each of the evaluation criteria. The allocation of 'weighting' to the evaluation criteria was considered independently from the first layer of evaluation, i.e. the individual scoring of options themselves. As there was no need to 'rank' the criteria in order of importance in this second analysis layer, the HETA Task Force experts were, in accordance with the taxonomy, free to assign the same 'weighting' score to different criteria where they considered it appropriate.

Weighting Score	Level of Importance of the Criteria
1	Very Low Importance
2	Low Importance
3	Important
4	High Importance
5	Very High Importance

Table 2: Taxonomy Used for the Weighting of the Criteria

The analysis mechanism that was then applied was a simple multiplication of the 'un-weighted' scores assigned to the options during the first layer with the 'weighting' scores assigned to the evaluation criteria.

B.2.2 Results of the Un-Weighted Multi-Criteria Analysis

For this part of the analysis, it was assumed that all the comparative evaluation criteria were of equal importance and so the weighting mechanism was not applied to the scoring system. The results of the un-weighted multi-criteria analysis are shown in Table 3 below.

Criteria	Consistency with the Aims of the EU Policies and Regulations	Relative Costs	Achievement of Objectives	Ease of Operational Implementation	Likelihood of Stakeholder 'Buy-In'	Total Score	Ranking
Option							
1	1	5	1.5	4	3.5	15	2
2	4	2	4	2	2.5	14.5	3
3	3.5	2.5	3.5	2.5	4	16	1

Table 3: Un-weighted Multi-criteria Analysis Results

B.2.3 Results of the Weighted Multi-Criteria Analysis

The un-weighted multi-criteria analysis was then modified by taking each of the un-weighted analysis scores assigned to the options in Table 3 above and multiplying them by the weighting score applied to the criteria. A revised total score for each option was then derived. The results of the weighted multi-criteria analysis are shown in Table 4 below.

The weighting applied by the HETA Task Force experts reflects the perceived need to obtain a high degree of support from Stakeholders in the current economic climate for any potential policy. It also takes account of the need for solutions to realise significant, long-term and broad benefits in order to provide a maximum return on investment. Therefore, achievement of the policy objectives was assigned very high importance. As some of the solutions could be complex because of the high degree of interaction needed between systems, procedures and personnel, and because some of the options could create potentially complex operational interfaces, operational implementation risks were also felt to be of high importance in any policy decision.

Mindful of the current economic climate faced by Stakeholders, the cost criterion was also set at weighting that reflected the high importance of this issue. However, any further in depth extended impact assessment will need to revisit the costs in more detail.

Although consistency with the wider aims of SES policy in the long run cannot be neglected, it was felt to be of less importance in the case of the TA than the other criteria because there is already a functioning system in place which is working reasonably well. Therefore even if no action would be taken, it can be expected that, in future, the ATM environment will also continue to function at least as well as currently observed.

Criteria	Consistency with the Aims of the EU Policies and Regulations	Relative Costs	Achievement of Objectives	Ease of Operational Implementation	Likelihood of Stakeholder 'Buy-In'	Total Score	Ranking
Option							
1	3	20	7.5	16	14	60.5	2
2	12	8	20	8	10	58	3
3	10.5	10	17.5	10	16	64	1
<i>Weighting Score</i>	3	4	5	4	4		

Table 4: Weighted Multi-criteria Analysis Results