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**The legality of „Mobile FliteDeck VFR“-charts
for the preparation and operation of flights
under Visual Flight Rules**

Legal Expert Opinion

presented to

**Jeppesen GmbH
Frankfurter Straße 233
63263 Neu-Isenburg**

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A. Preliminary remarks

Jeppesen GmbH, residing at Frankfurter Straße 233, 63263 Neu-Isenburg, Germany, requested me to provide them with a legal opinion on the question whether their charts, as integrated and displayed on their „Mobile FliteDeck VFR”, are allowed as a means for preparation and operation of flights under Visual Flight Rules (VFR).

B. Situation

The „Mobile FliteDeck VFR“ is an iPad based application, used for pre-flight preparation and flight operation, as well as for flights under Visual Flight Rules (VFR flights). It holds all essential charting information for en-route, approach- and departure phases at aerodromes. As well as ground movement charts, including the additional textual information (e.g. operational hours of aerodromes, airspace restrictions etc.), and NOTAM and weather information. While connected to the GPS the pilot receives continuous indication of the actual flying position of the aircraft.

The source data used by Jeppesen is not just “copied and pasted” into the product. But it is obtained, analyzed, verified and checked on plausibility, through clearly defined processes. This frequently leads to the recognition of potential errors in the data published by the authorities. And, after verifying it, to correction of the data, even before they reach the customer as a Jeppesen product. Furthermore, all data is verified according to the “four-eyes-principle” before storage into Jeppesens’ databases. Adaptation of this principle by Jeppesen gives the assurance that a second person carries out exactly the same process steps, independently from the other one, while re-checking and verifying again all data entries. Any particular data like coordinates, frequencies, flight levels etc. are being verified by the so called “Blind Re-key” process. This means that at first the “verifier” does not see any data which has been entered before by a colleague. The verifier solemnly enters the data again on the basis of the original source in an empty data field. Only upon the exact match of both data entered, a “verified” comment appears and the data can be stored in the database.

The VFR charts used by Jeppesen in the „Mobile FliteDeck VFR“ are in terms of layout, color, icon-use and information displayed in line with the traditional Jeppesen paper charts. However, the charts used in the app are generated from a database. Every 28 days the data (both charts and text) is being amended by an update service in accordance with the so-called AIRAC cycle.

The specific question is whether this product is able to replace the traditional paper charts used for pre-flight preparation and flight operation of VFR flights. This means in particular; will pilots meet their safety obligations in preparing and operating VFR flights when using the charts of the “Mobile FliteDeck VFR” instead of the traditional paper charts?

C. Legal Analysis

The answer to the posed question depends on the kind of requirements the relevant regulations specifically impose on pilots and how these requirements have to be interpreted.

It has to be taken into account, before reading, that legal regulations are the kind to be formulated in general terms only. And therefore, cannot be expected to be formulated in such a way that they explicitly and exclusively state any requirements for a particular medium. In this case “paper charts”. By upholding strict formulation, the legislator would place unnecessary strain on technical developments. It is far more convenient for the legislator to provide just general requirements which, on one hand, are fully met by the traditional paper charts and, on the other, do not rule out any new developments in advance. This means that when interpreting the relevant regulations the traditional understanding should not be considered as the only one correct. Also new developments could meet these requirements in case they perform equally or even better.

On the contrary, these considerations cannot lead to a hasty conclusion that the relevant regulations do facilitate the use of any other medium than paper charts when preparing and conducting a flight. The kind of requirements that are to be met by the navigational means of choice have to be worked out and defined with reference to the whole purpose of these regulations and their backgrounds within the total framework of the concept of aviation law as well. For this purpose the relevant characteristics of current paper charts could be used as an important benchmark, because their suitability as means for flight preparation have been widely and fundamentally accepted, and therefore will meet the legal requirements without any reasonable doubt.

I. The relevant legal bases

It is common knowledge that technical and operational aviation law has been internationalized and is shaped substantively by the Chicago Convention (1944)¹. Its technical annexes and additional documents by ICAO², founded as a result of the Convention (1947), as well. Today 191 States are members of ICAO. Since the European Union is not a state, it is not a member of ICAO. But all its single Member States are. Germany became an ICAO member by signing the Chicago Convention in the year 1957³.

The technical and operational requirements for aviation are formulated by ICAO in „Standards and Recommended Practices“ (SARPs) and published as Annexes to the Chicago Convention. As is the, in this case appropriate, Annex 2 on the „Rules of the Air“⁴.

¹ Convention on International Civil Aviation - Doc 7300, <http://www.icao.int/publications/Pages/doc7300.aspx>.

² International Civil Aviation Organization – Internationale Zivilluftfahrtorganisation.

³ Abkommen über die internationale Zivilluftfahrt (Chikagoer Abkommen) vom 7. Dezember 1944 (BGBl. 1956 II S. 411).

⁴ http://www.horoug.com/horoug_files/icao_regulations/ICAO%20Annex%202%20-%20Rules%20of%20the%20Air.pdf.

Since ICAO does not have legislative power on its own and its Member States did not transfer any of theirs in return to ICAO⁵, requirements can only become binding law when Member States adapt the applicable requirements as regulations within their own respective sovereign territory.

For this reason the Signatory States of the Chicago Convention have committed themselves - in accordance to its article 37 - to adopt the ICAO standard into their national laws. They are only allowed to deviate from the applicable standard, after they have formally reported this to ICAO. As stated in article 38 of the Chicago Convention. In contrast, an obligation to implement "Recommended Practices", does not exist. Due to their legal nature they remain just recommendations⁶.

Because of not being a "State" the European Union is not an ICAO member and never will be either. In this triangle of ICAO, EU and Member States (both of ICAO as well as the EU) it has to be considered that the EU through its internal relations has received legislative authority in the area of aviation (based on article 90 seq. TFEU⁷) by its Member States. They exercise this authority on their behalf more and more. A Member State of both ICAO as the EU - like Germany – does not meet its obligation according to article 37 of the Chicago Convention on its own. It has delegated compliancy to this obligation to the EU, as part of their internal relations. Neither EU law, as far as it already exists, nor national law, as far as it still exists, are allowed to contradict with the standard set by ICAO.

In the following chapter, the applicable ICAO standard and its relevance will be discussed. Thereafter, the implementing rules in the USA, Germany and the EU will be compared.

⁵ Unlike the EU, ICAO is not a „supra“national organization above its member states but merely an “inter“national organization between its member states.

⁶ See also the explanations in the foreword of Annex 2 below the header „Status of Annex components“.

⁷ Consolidated version of the Treaty on the Functioning of the European Union, Official Journal C 326, 26/10/2012 P. 0001 – 0390, <http://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:12012E/TXT&from=DE>.

1. The ICAO standards

a) Wording and meaning of the relevant standards

Relevant to the subject discussed is ICAO-Annex 2⁸ („Rules of the Air“). In this Annex the role of the pilot-in-command is defined, as well as his obligation to prepare and conduct a flight and operate the aircraft in a proper manner:

“Chapter 1 - Definitions: pilot-in-command.

The pilot designated by the operator, or in the case of general aviation, the owner, as being in command and charged with the safe conduct of a flight.

Chapter 2 - Applicability of the rules of the air

2.3 Responsibility for compliance with the rules of the air

2.3.1 Responsibility of pilot-in-command

The pilot-in-command of an aircraft shall, whether manipulating the controls or not, be responsible for the operation of the aircraft in accordance with the rules of the air, except that the pilot-in-command may depart from these rules in circumstances that render such departure absolutely necessary in the interests of safety.

2.3.2 Pre-flight action

Before beginning a flight, the pilot-in-command of an aircraft shall become familiar with all available information appropriate to the intended operation. Pre-flight action for flights away from the vicinity of an aerodrome, and for all IFR flights, shall include a careful study of available current weather reports and forecasts, taking into consideration fuel requirements and an alternative course of action if the flight cannot be completed as planned.

2.4 Authority of pilot-in-command of an aircraft

The pilot-in-command of an aircraft shall have final authority as to the disposition of the aircraft while in command.”

These standards thoroughly describe the specifications according to which the Member States have to formulate the legal situation of a pilot-in-command. He is the one who will be made responsible for compliance with the “Rules of the Air” (2.3.1) and for pre-flight preparation (2.3.2). After all in case of doubt he shall have final authority as to the disposition of the aircraft (2.4).

⁸ http://www.horoug.com/horoug_files/icao_regulations/ICAO%20Annex%202%20-%20Rules%20of%20the%20Air.pdf

Standard 2.3.2 concerning pre-flight action requires that, before commencement of the Flight the pilot-in-command shall familiarize him-/herself with *all available and adequate information* appropriate for the intended operation. It is not explicitly expressed in this standard that this information has to come stringently and exclusively from paper charts only. It is not even required for this information to be made available by AIS⁹, irrespectively in what kind of medium it is stored. Or that – in case the information is made available by others – it has to be based upon information from AIS. Even paper charts produced by AIS or others using AIS information, are traditionally seen as “appropriate” according to the standard. As this does not explicitly exclude other media beforehand, they also could be marked as “appropriate” for the intended operation.

An important indication as to what can be referred to as „appropriate“ can be extracted from the explanation of the whole purpose of the role and responsibilities of the „pilot-in-command“, as stated in Annex 2:

Chapter 1: Definitions

As part of the definition of a pilot-in-command it is emphasized that he is „charged with the safe conduct of a flight“.

Chapter 3:

“3.1.1 Negligent or reckless operation of aircraft

An aircraft shall not be operated in a negligent or reckless manner so as to endanger life or property of others.”

This means in cases of equipment certified for the preparation and operation of a flight, that with their use a safe flight operation must be guaranteed, and that in no event they have the potential to endanger life and property of others. Therefore they must be reliable (meaning excellent system stability) – substantially and technically – to the extent that they ensure a flight operation classified as „safe“.

One may argue about how this obvious and general safety requirement¹⁰ formulated in the ICAO documents can be determined for specific media in detail. And at the same time with regard to the proper awareness and responsibility as well – especially in cases of new technological developments. The final „say“ is with the pilot-in-command (Annex 2, Chapter 2.4: „final authority“), who’s judgment will always support decision making towards a minimum risk in operating an aircraft in a negligent or reckless manner (Annex 2, Chapter 3.1.1). With this responsibility in mind the pilot-in-command has to assess, what kind of media will enable him the most in minimizing the risk of endangerment of life and property of others¹¹.

Indisputable starting point of such a consideration may be the traditional perspective according to which paper charts, published by AIS, meet the necessary requirements.

⁹ Aeronautical Information Service.

¹⁰See also the preamble as well as article 44 of the Chicago Convention.

¹¹In this respect of the same opinion: Gemeinsame obere Luftfahrtbehörde Berlin-Brandenburg, Zur Zulässigkeit der Verwendung externer elektronischer Navigationshilfen und zur fortgeltenden Verpflichtung zur Mitführung von Papierkarten bei VFR-Flügen, http://www.lbv.brandenburg.de/dateien/luftfahrt/140721_Info_Navaids.pdf.

This is also applicable for paper charts published by other producers, as long as layout and information are based on the source information made available by AIS¹². Annex 2, chapter 2.3.2, does not explicitly exclude other media. So this means that the following media under the following circumstances are compliant with the required standard in any case:

- AIS paper charts:

Paper charts, which are published by AIS, meet the necessary requirements according to standard 2.3.2 of Annex 2, without any doubt.

- Other media:

In case of deviations a differentiated view with multiple possibilities is required: First of all, 'any other media but AIS paper charts' could be paper charts of other producers; it could also be other media than paper, published by AIS. And finally also other media than paper charts published by other producers may be considered. Most concerns are about this last category.

All other media at least meet the necessary requirements according to standard 2.3.2 of Annex 2, when considered equivalent to AIS paper charts in the whole purpose of Annex 2 (safe conduct of flight, prevention of endangerment of life and property).

o Paper charts of other producers:

Paper charts of other producers are considered equivalent, in case they are at least based on the AIS information, and have more or less the same quality (accuracy, completeness etc.) as these charts. This is traditionally the case for Jeppesen paper charts.

o Other media than paper charts published by AIS:

Here, reliability of the content is not an issue, since these suppliers upload their information also directly from AIS sources. Debatable however is whether this medium possesses the high level of technical reliability that with respect to Annex 2 also needs to be obtained.

o Other media than paper charts published by other producers:

With regard to the reliability of the content there is no difference from paper charts, as long as it can be guaranteed that the information uploaded in the medium is based on AIS as well. This means, that essential to the acceptance of other media than paper charts - no matter if they are published by AIS or other producers – has to be the requirement of information being based upon AIS information as well. Only with this, its reliability in terms of content can be assured without a doubt.

Equal to other media published by AIS the necessary technical reliability level has to be questioned here as well.

With regard to the legal requirements concerning the suitability or "appropriateness" of the information made available with the help of other media

¹² Cf. In detail Giemulla/Schmid, Die Jeppesen-Fluginformations-Publikationen unter dem Blickwinkel des Luftrechts (The Jeppesen Flight Information Publications under the Aspect of Air Law), NZV 1999, 115 ff.

than paper charts no difference exists between media made available by AIS and such offered by other producers in case the following aspects can be ensured:

- Substantial reliability:

The respective producer has a system in place that ensures that the information contained in his product has at least the same reliability (in the sense of accuracy, completeness, actuality etc.) as the official AIS media. This is unquestionably the case with Jeppesen.

- Technical reliability:

And finally, the medium must be able to deliver a comparable level of technical reliability equal to the one of traditional paper charts.

b) Guidelines for the translation into national regulations

In its preface to Annex 2 ICAO has laid down the following guidelines for execution into national regulations:

- First, it is pointed out explicitly that Annex 2 contains ‘Standards only’ and ‘no Recommended Practices’ whatsoever¹³.
- Furthermore, with regard to the translation into national regulations under the headline „Application“ the following is said:

“Use of the text of the Annex in national regulations. The Council, on 13 April 1948, adopted a resolution inviting the attention of Contracting States to the desirability of using in their own national regulations, as far as practicable, the precise language of those ICAO Standards that are of a regulatory character and also of indicating departures from the Standards, including any additional national regulations that were important for the safety or regularity of air navigation. Wherever possible, the provisions of this Annex have been written in such a way as would facilitate incorporation, without major textual changes, into national legislation.”

This text clearly states that the national implementation of these requirements is mandatory and has to be done without major textual changes, whenever possible. At least it has to be performed in such a way that these requirements are clarified without being in contradiction to the requirements of Annex 2.

With this, also the aspects outlined above regarding the understanding of what “appropriateness” means has to be taken as a basis for national legal regulations.

2. The legal situation in the USA

¹³ See also the foreword under the header „Editorial Practices“: „There are no *Recommended Practices* in Annex 2”.

In the USA the relevant implementing rules are part of the Code of Federal Regulations, Title 14, Chapter I, Subchapter F, Part 91, Subpart A and B¹⁴, which states:

“§91.103 Preflight action.

Each pilot in command shall, before beginning a flight, become familiar with all available information concerning that flight. This information must include—

(a) For a flight under IFR or a flight not in the vicinity of an airport, weather reports and forecasts, fuel requirements, alternatives available if the planned flight cannot be completed, and any known traffic delays of which the pilot in command has been advised by ATC;

(b) For any flight, runway lengths at airports of intended use, and the following takeoff and landing distance information:

(1) For civil aircraft for which an approved Airplane or Rotorcraft Flight Manual containing takeoff and landing distance data is required, the takeoff and landing distance data contained therein; and

(2) For civil aircraft other than those specified in paragraph (b)(1) of this section, other reliable information appropriate to the aircraft, relating to aircraft performance under expected values of airport elevation and runway slope, aircraft gross weight, and wind and temperature.”

These regulations are within the framework of the ICAO standard as mentioned previously. They are partially repetitive, while on the other hand, they intensify the regulations without being in contrast to them. The requirement, that before his flight a pilot has to make himself familiar with all available information, has been executed into binding national law of the United States by the stated regulation.

However, the clarification which has been made regarding standard 2.3.1 – that the information has to be „appropriate to the intended operation“ – has not been taken over literally but formulated in detail with different words. There is no need to discuss here whether the wording covers completely all quoted ICAO phrases because they refer only to the topics of the information and not to the kind of medium – here discussed - through which the information is transported.

It can be stated at least that the US American version of the regulations do not contain any further restrictions which means that for the question about the reliability of using other media than paper charts and about its suitability (“appropriateness”) the same criteria apply as the one already worked out in relevance to the ICAO standards.

Also the role of the pilot-in-command has been adapted in the US regulations according to ICAO-Annex 2, Chapter 2.4. The applying regulation states:

¹⁴ http://www.ecfr.gov/cgi-bin/retrieveECFR?gp=&SID=c372f1bb70d8b62e41802a5f19ecd6c2&mc=true&n=pt14.2.91&r=PART&ty=HTML#se14.2.91_13.

“§91.3 Responsibility and authority of the pilot-in-command.

(a) The pilot in command of an aircraft is directly responsible for, and is the final authority as to, the operation of that aircraft.”

Therefore, the considerations mentioned above concerning the understanding of the applicable ICAO standards are also adaptable here.

3. The legal situation in Germany

The German regulation, converted straight from the ICAO standard as previously mentioned, into German law has become inevitably redundant since the adaptation of EU regulation within aviation law (SERA – see in detail below 4.)¹⁵.

The current applicable regulation § 3a Abs. 1 LuftVO (flight preparation) states:

„Bei der Vorbereitung des Flugs hat der Luftfahrzeugführer sich mit allen Unterlagen und Informationen, die für die sichere Durchführung des Flugs von Bedeutung sind, vertraut zu machen

“When preparing a flight the pilot has to familiarize himself with all documents and information relevant for a safe conduct of flight.....”

Also this (abandoned in the meantime) implementing regulation contained no specific obligation to prepare a flight by paper charts. Unlike the known ICAO standard this regulation not only referred to “information” only but in addition also to “documents” (“Unterlagen”). One may interpret the additional term “documents” as proof that only paper charts are covered, forming through this a stringent requirement. This, however, would not be a convincing argument in any case since the term “information” has not been replaced by that; in fact its term is mentioned explicitly and additionally in this regulation. Moreover, the regulation is not very much consistent in its way of formulating, because it addresses different categories with the stated terms: While the term „documents“ (“Unterlagen”) refers more to the medium itself, the term „information“ refers more to the content which is uploaded in a medium. Or in other words: A document (“Unterlage”) certainly contains information and vice versa information must not absolutely and exclusively be derived from (physical) documents. Well known are also other media (for e.g. an electronic FliteDeck) providing information.

In general it can be stated that also the previous § 3a Abs. 1 LuftVO did not exclude the use of other media than paper charts.

Even though § 8 Nr. 3 der 3. DVO zur LuftBO¹⁶ is still operative, it does not justify a different view.

According to this passage, "sind Flugzeuge und Hubschrauber mit aktuellen und entsprechend der Betriebsart geeigneten Karten für die geplante Flugstrecke ...

¹⁵ Luftverkehrs-Ordnung vom 29. Oktober 2015 (BGBl. I S. 1894) – Regulation on the Rules of the Air.

¹⁶ Implementing Rules to the German Flight Operations Regulation.

auszurüsten“ („aeroplanes and helicopters have to be equipped with current and – depending on the kind of operation - appropriate charts for the intended flight route ”) .

Even in cases where „charts“ are traditionally executed on paper and, therefore, the first thought when hearing the term „chart“ is about a paper chart, this is not stringent at all anymore considering the ongoing technological innovation; because also in a mobile FliteDeck charts can be seen. The requirement set out in the regulation mentioned above stating that the charts have to be “current” is also met by electronic charts, at least the same way as paper charts (maybe even better because of the regular update service).

Also this regulation is not in contrast to the use of a mobile FliteDeck in any case.

The role of the pilot-in-command was described in the previous LuftVO as follows:

„§ 3 LuftVO

Rechte und Pflichten des Luftfahrzeugführers

Rights and duties of the pilot

(1) Der Luftfahrzeugführer hat das Entscheidungsrecht über die Führung des Luftfahrzeugs. Er hat die während des Flugs, bei Start und Landung und beim Rollen aus Gründen der Sicherheit notwendigen Maßnahmen zu treffen.

The pilot has the final authority of controlling the aircraft. He has to take the necessary safety precautions during flight, take-off, landing and taxiing.

(2) Der Luftfahrzeugführer hat dafür zu sorgen, dass die Vorschriften dieser Verordnung und sonstiger Verordnungen über den Betrieb von Luftfahrzeugen sowie die in Ausübung der Luftaufsicht zur Durchführung des Flugs ergangenen Verfügungen eingehalten werden.“

The pilot has to ensure that the regulations of this and other ordinances regarding the operation of aircraft and regarding the orders given by aviation supervisory authorities in case of flight operations will be observed.”

According to the ruling legal position in Germany, the question about the estimation of the safety level of digital media compared to paper charts rests with the pilot-in-command. The leading arguments in this case are the levels of substantial and technical reliability compared to that of paper charts (see also in more detail III.).

4. The legal situation in the EU

The legal situation in the EU (and with it also in Germany) is now as follows:

a) The basic regulation (EC) No 216/2008

According to Article 8 paragraph 1 of Regulation (EC) 216/2008¹⁷, the operation of aircraft must meet the basic requirements of Annex IV. The relevant regulation states:

„2. Flight Preparation

2.a. A flight may only commence unless it has been ascertained by every reasonable means available that all the following conditions are complied with:

2.a.1. Adequate equipment directly required for the flight and for the safe operation of the aircraft, including communication facilities and navigational aids, is made available for the execution of the flight, taking into account available Aeronautical Information Services documentation.”

Other than the relevant ICAO standard and the discussed binding legal bases this regulation contains a specific indication of the “available AIS documents of the Aeronautical Information Services”. According to ICAO Annex 15 these documents are also aeronautical charts.

This statement may not mislead one into the assumption that this regulation requires a pilot to make himself familiar with AIS paper charts only, that the use of any other means is not permitted. This would be contrary to the ICAO standard discussed above. A close reading of this regulation shows in addition that it has been formulated fundamentally differentiated.

On the one hand the subject of the regulation that postulates it is not the mentioned AIS documentation but the “equipment” directly required for the flight and for the safe operation of the aircraft. Regarding the “AIS documents”, they are not mentioned as part of the “equipment” – only in this case, the obligation to have them available would be affected. In fact, the regulations postulate only that the adequate equipment should be taken into account in the available AIS documents. The imprecise German translation

¹⁷ REGULATION (EC) No 216/2008 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 20 February 2008 on common rules in the field of civil aviation and establishing a European Aviation Safety Agency, and repealing Council Directive 91/670/EEC, Regulation (EC) No 1592/2002 and Directive 2004/36/EC (OJ No. L 79 of 19 March 2008, p. 1), as amended by: COMMISSION REGULATION (EC) No 690/2009 of 30 July 2009 amending Regulation (EC) No 216/2008 of the European Parliament and the Council 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 No. L 199 of 31 July 2009, p. 6), REGULATION (EC) No 1108/2009 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 21 October 2009 amending Regulation (EC) No 216/2008 in the field of aerodromes, air traffic management and air navigation services and repealing Directive 2006/23/EC (OJ No. L 309 of 24 November 2008, p. 51), COMMISSION REGULATION (EU) No 6/2013 of 8 January 2013 amending Regulation (EC) No 216/2008 of the European Parliament and of the Council 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 No. L 4 of 9 January 2013, p. 34) and COMMISSION REGULATION (EU) 2016/4 of 5 January 2016 amending Regulation (EC) No 216/2008 of the European Parliament and of the Council as regards essential requirements for environmental protection (OJ No. L 3 of 6 January 2016, p. 34).

of the word “available” misleads to the erroneous conclusion that the documents physically have to be on board of the aircraft. The wrong translation of “available” as “vorhanden” may be applicable to the mentioned “equipment” but certainly not the AIS documents. If it would be meant like this, it should have been expressed differently. It should have been formulated in such a way that radio communication equipment and navigational aids are included.

However, the available AIS documents have been integrated into the regulation in such a way that they have to be taken into consideration when using physical available equipment on board. Any other understanding than this would be artificial and would subsequently raise questions about – without any reason – the already generally accepted procedure to estimate also paper charts of other producers (as far as they are based on AIS documents) as appropriate for the use for flight planning and flight operation.

This is certainly not eligible. Hence, for logical reasons the present regulation in combination with the higher ICAO standard can be interpreted only in a way that it wants to ensure that with all equipment being carried along the AIS documents were taken into account. With this nothing is said about the specific configuration of the equipment (paper or other media). A restriction (limitation) to paper charts or the exclusion of other media cannot be interpreted in this regulation in any case.

This would also contradict the “airspace Regulation”¹⁸ of the EU. According to article 3a para 1 “the Commission, working in cooperation with Eurocontrol, shall ensure the availability of electronic aeronautical information of high quality, presented in a harmonized way and serving the requirements of all relevant users in terms of data quality and timeliness.” The details are set forth in the Implementing Rule No 73/2010¹⁹ and explained in ED Decision 2014/001/R 09/02/2014 Annex II AMC 20-25²⁰.

It would not be plausible for the EU to foster the proliferation of electronics by means of harmonized standards and to block their concrete application at the same time.

In addition, such a view could even not be reconciled with the meanwhile widespread practice of many States to offer AIS information not only in paper, but in digital format as well. So the Aeronautical Information Publications of all European States are available for all users in digital format in the European Aeronautical Database (EAD) which was developed by Eurocontrol. It applies to textual information and charts as well.

¹⁸ Regulation (EC) No 551/2004 of the European Parliament and of the Council of 10 March 2004 on the organisation and use of the airspace in the single European sky (the airspace Regulation) (OJ No. L 96 of 31 March 2004, p. 20), as amended by: Regulation (EC) No 1070/2009 of the European Parliament and of the Council of 21 October 2009 amending Regulations (EC) No 549/2004, (EC) No 550/2004, (EC) No 551/2004 and (EC) No 552/2004 in order to improve the performance and sustainability of the European aviation system (OJ No. L 300 of 14 November 2009, p. 34).

¹⁹ COMMISSION REGULATION (EU) No 73/2010 of 26 January 2010 laying down requirements on the quality of aeronautical data and aeronautical information for the single European sky (OJ No. L 23 of 27 January 2010, p. 6), as amended by: Commission Implementing Regulation (EU) No 1029/2014 of 26 September 2014 amending Regulation (EU) No 73/2010 laying down requirements on the quality of aeronautical data and aeronautical information for the single European sky (OJ No. L 284 of 30 September 2014, p. 9).

²⁰ <https://www.easa.europa.eu/.../2014-001-R-Annex%>

In the meantime in Germany all information provided by AIS (e.g. Aeronautical Information Publication, aeronautical charts) are available on paper or in a digital environment. The German Aeronautical Information Publication AIP (including the charts as part of it) in electronic format is considered completely equal to its publication in paper. This means that the digital version is also the “authorized” version. The preface to the German Aeronautical Information Publication AIP²¹ points out this fact explicitly:

„3. Publication media

The Aeronautical Information Publication Germany is published in three versions: paper, CD-ROM, online (Internet). CD-ROM and online versions include the complete contents of the paper version.

The paper version, the CD-ROM as well as the online versions apply as official publications of the Aeronautical Information Publication Germany and are, therefore, considered to rank equally.”

In addition, the German publication „Nachrichten für Luftfahrer (NfL“) which contains official announcements to aviators are published digitally only; the paper production has already been suspended some time ago.

Also this practice demonstrates that the digital transmission of information is not a foreign matter in aviation anymore. Hence, there is no reason to read the applicable regulation in any other way.

Digital media such as the „Mobile FliteDeck VFR“ are not excluded beforehand from the regulation mentioned above.

b) Implementing Regulation (EU) No 923/2012, Rules of the Air, Annex SERA.2010 and 2015

With respect to flight preparation and responsibility, the already standardized European „Rules of the Air“²² read as follows:

„SERA.2010 Responsibilities

b) Pre-flight action

Before commencing a flight, the pilot-in-command of an aircraft shall become familiar with all available *information* appropriate to the intended operation. Pre-flight action for flights away from the vicinity of an aerodrome, and for all

²¹ Aeronautical Information Publication, <http://www.eurocontrol.int/articles/ais-online>.

²² Annex to Commission Implementing Regulation (EU) No 923/2012 of 26 September 2012 laying down the common rules of the air and operational provisions regarding services and procedures in air navigation and amending Implementing Regulation (EU) No 1035/2011 and Regulations (EC) No 1265/2007, (EC) No 1794/2006, (EC) No 730/2006, (EC) No 1033/2006 and (EU) No 255/2010 (OJ No. L 281 of 13 October 2012, p. 1) as amended by: COMMISSION REGULATION (EU) 2015/340 of 20 February 2015 laying down technical requirements and administrative procedures relating to air traffic controllers' licences and certificates pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council, amending Commission Implementing Regulation (EU) No 923/2012 and repealing Commission Regulation (EU) No 805/2011 (OJ No. L 63 of 6 March 2015, p. 1).

IFR flights, shall include a careful study of available current weather reports and forecasts, taking into consideration fuel requirements and an alternative course of action if the flight cannot be completed as planned.” (Note: Emphasis added).

This regulation – as far as of importance in the present case – is nothing else than a word-for-word repetition of the ICAO Standard. Also a reference is made here to “information” only and not to the media which will be used as a vehicle of information. Therefore, also the previous developed understanding has to be used when answering the question which requirements have to be applied to media, which are not in line with the requirements applied to traditional paper charts.

Furthermore, at the time when the implementation of the ICAO Standard took place in 2012 electronic AIS information was already available on the market and used extensively in the cockpit. In case the EU lawmaker would have wanted to prevent or even abandon it, it would have been easy for him to do so and to express it in the relevant regulation. However the unconditional and unrestrictedly adoption of the relevant ICAO standard by the EU lawmakers demonstrates that it was not the intention to exclude the use of digital media in any case.

Regulations of the „Soft Law“ of EASA, in particular the “Acceptable Means of Compliance and Guidance Material to the rules of the air” of 17th July 2013²³, do not make any kind of statement in accordance to SERA.2010. Obviously, EASA considers these regulations as clear in a way that there is no need for further interpretation. In view of the foregoing, that the regulation just turns the long approved ICAO standard into binding law, is no longer worth mentioning.

Concerning the question of the responsibility of the pilot-in-command and his final authority SERA contains the following regulations:

„SERA.2010 Responsibilities

a) Responsibility of the pilot-in-command

The pilot-in-command of an aircraft shall, whether handling the controls or not, be responsible for the operation of the aircraft in accordance to this Regulation, except that the pilot-in-command may deviate from these rules in circumstances that render such departure absolutely necessary in the interests of safety.”

„SERA.2015 Authority of pilot-on-command of an aircraft

The pilot-in-command of an aircraft shall have final authority as to the disposition of the aircraft while in command.

²³ <https://www.easa.europa.eu/system/files/dfu/Annex%20to%20ED%20Decision%202013-013-R.pdf>.

Also in accordance to EU regulation, the final authority in reference to the question, which kind of medium a pilot uses for his pre-flight preparation and his flight operation, rests with the pilot-in command. It is his own responsibility to assess with what kind of medium he can prevent the endangerment of life and property. The main criteria for this assessment are a level of substantial (content) and technical reliability comparable with a traditional paper chart (see also in detail III).

II. Summarized interpretation of the legal bases

The interpretation of the individual legal bases as discussed above can be summarized as follows:

1. Wording

First it has to be stated that the wording of the relevant ICAO Standard and the respective binding legal regulations in the USA as well as in the EU do not rule out the use of the “Mobile FliteDeck VFR” and with it the use of the available charts for pre-flight preparation and flight operation. The wording just refers to “information” without saying anything about the kind of media the pilot-in-command should use in order to make this information available to himself. Especially it is not stated anywhere that a pilot has to meet his obligation by using paper charts.

According to the wording of the ICAO standards or the relevant binding legal regulations, the information must be “appropriate” for the intended operation. Even if paper charts are seen traditionally (with good reason) in conformity with the stated requirements it does not mean that it cannot be applicable to other media. They are also usable, in case they are as “appropriate” as paper charts.

2. The idea of the law

This also will be confirmed by the whole purpose of these standards or regulations. Accordingly, the information used shall serve the safety of flight which means the prevention of harm to life and property. To interpret the term “appropriateness” of the media used it must be sufficient to orient oneself by the characteristics of traditional used media. Namely by paper charts which are either published by AIS services itself, or through companies which production is based on the information of the AIS service.

III. Conclusions: Requirements for other media than paper charts used for flight preparation and flight operation

It can be assumed that with regard to the legal aspects concerning the “adequacy” of the presented information, made available through other media than paper charts, there is no difference between media provided by AIS services and those provided by other “producers”. Against the background of their duty to ensure the highest possible level of safety the requirements encompass the following two aspects:

1. Reliability of the information

It must be guaranteed that the respective producer uses a system that ensures that the information contained in his distributed media has at least the same level of accuracy (in the sense of completeness, actuality etc.) like the official AIS media. As already described in detail above (B. Situation) there is no question about Jeppesen.

2. Technical reliability (in particular safety failure)

In addition, these media must have the same structural availability as traditional paper charts. Regarding the defined requirements, it has to be taken into account that there is no media and will not be in the future that meets these requirements 100% in every situation. Even paper charts could become outdated, even paper charts could contain wrong and incomplete information, even paper charts could be destroyed or spoiled or get lost. Therefore, the introduction of new media cannot be measured against requirements, which ignore the weaknesses of traditional media by setting the goal of total safety and by doing that preventing innovations. Realistically only the defined goal described in Annex 2 (3.1.1) – not to endanger life or property of others in a reckless manner – can be the standard that should be reached.

This means by comparing new media to traditional paper charts the individual and above-mentioned elements cannot be considered isolated but only through an overall evaluation focusing mainly on the question of technical reliability.

In fact, “traditional” paper charts are still regarded as more reliable than electronic media when comparing the traditional paper charts with new media. This happens despite the fact that electronics, in particular for navigation purposes, already found their way many years ago into the cockpit, even in cockpits of aircraft flying under Visual Flight Rules (VFR). The digitally or electronically generated aeronautical chart (together with the indication of the aircraft’s position by means of GPS) serves for more and more pilots as the main navigational tool and the paper chart degrades into just an accessory. Besides, digital charts are not only manufactured by non-governmental companies like Jeppesen for instance. Even official AIS services offer licensing agreements to use digital charts for navigation systems.

These navigation systems could be integrated parts of the cockpit’s panel instrumentation or just software used for navigational purposes installed on a tablet PC, like the „Mobile FliteDeck VFR“. In either case, the required chart section will be shown together with the actual position of the aircraft calculated by GPS.

A pilot using paper charts has to make sure that all the necessary charts for the planned flight are on board of the aircraft and at hand all times. Again, also a pilot using electronic navigational means (instead of paper) has to make sure that the software, the appropriate data, has been stored, and the required charts can be uploaded at any time. In addition, he has to make sure that the power supply for the portable tablet PC is guaranteed and available for the entire flight. To put it simply, the navigation equipment and systems have to be in good working condition.

However, we also have to take into consideration that this is not a brand new phenomenon and therefore inextricably linked with the safe operation of a technical device like an aircraft. Therefore, it does not present new challenges to pilots. Within the scope of the general obligation of a pilot not to endanger life and property of others he has prepare himself anyway for the right measures to be taken in case of an emergency (e.g. engine failure) or in case of a single device failure or instrument failure (e.g. failure of radio transceiver , failure of airspeed indicator). In the specific case, he has to consider that the portable iPad (or functions of it) could malfunction; the same way he has to take into consideration that the paper chart could fall off his seat while performing an abrupt flight maneuver and could not be reached anymore during the remainder of the flight.

a) Failure scenarios

In case of failure, three essential scenarios are imaginable:

- The GPS information is not available anymore: The pilot no longer receives any indication of the aircraft's position. However with the help of the electronic chart (still available) and by observing the characteristics of the visual landscape; he still could determine his position. This kind of failure would give the pilot the same level of safety as traditional charts.
- The power supply fails: This failure can be handled by connecting with an external power supply (battery). It is up to the pilot to prepare for this kind of failure. A failure risk, which could lead to a negative impact on safety, cannot be identified.
- The complete device fails: This complete failure can be handled only by using a spare unit. Jeppesen hands out two licenses when purchasing a "Mobile FliteDeck VFR". To prepare for this case it's up to the pilot to install the second software on another iPad and to carry this second device with him.

b) Assessment of the failure scenarios

The question therefore is, whether the risk of a total failure leads to a downfall below the required safety level to such an extent that it is unacceptable in aviation.

It should be stressed here again that in case of a safety assessment 100%-safety cannot be obtained. In case of technical innovations it should be sufficient to acquire a level of safety comparable to traditional equipment ("equal level of safety").

- Comparison with the traditional paper charts

The „risk of failure” of traditional paper charts seems lower than of charts on digital media, at least at first glance. Because a paper chart is not a technical device, a risk of failure does nearly not exist, in the strict sense of the word (unless at the event of a sudden disappearance of the paper chart). Nevertheless, the “risk of failure” also exists with paper charts, however in a different way than with digital media.

In a safety assessment, it cannot be discarded that it is the obligation of a pilot to keep charts up to date and to enter changes (e.g. airspace, frequencies) on the chart. With AIS-documents, this happens by a regular amendment service to the Aeronautical Information Publication AIP and AIP VFR. The charts containing these official documents will be replaced by new ones and kept up to date. However, this does not work with the Aeronautical Chart ICAO 1:500000, because this specific chart will be published only once a year (spring). For this reason the AIP VFR contains a list of “Selected Corrections”. This list will be amended every 28 days or earlier when necessary. It is up to the pilot to take note of the changes and to enter these into the aeronautical chart manually. Whether he indeed captures all changes or not, is an open question. Since the list mentioned above contains “Selected Corrections” only. This results to the fact that a once purchased chart will not be consistent with the required actuality after some time even if this chart still physically exists.

This is fundamentally different with the „Mobile FliteDeck VFR“. Here the charts are generated from a database. The data will be kept up to date by a regular 28 days amendment service; this service also applies to the VFR-enroute chart.

It is believed that a traditional paper chart is available permanently because a paper chart is still seen more resistant than software or an electronic media in general. “Permanence” (longevity) in today’s fast changing aviation has the severe disadvantage, that paper charts are not up to date anymore even after a short period of time. With charts supported by databases, this does not happen.

With respect to the already mentioned obligation of a pilot not to endanger life or property the “permanent availability” of paper charts seems to become a risk rather than a safety benefit.

- **Comparison with other technical devices and instruments**

So far it has to be taken into account that digital media like a technical device shares the same risk of a failure with all other technical devices – also with these, which are normally used in an aircraft. Whatever the failure scenarios could be and a pilot has to bear in mind – they all are not limited to a failure of a tablet PC with a specific software used for navigation purposes but rather to all devices and instruments, which are necessary for the safe conduct of a flight. In a cockpit of an aircraft certified for VFR-flights all instruments are single ones. It is easy to imagine that the failure of a single instrument important for the flight management would have much more severe consequences than the “failure” of an aeronautical chart.

Even in the case that a chart fails completely at once there are many possibilities available by the Air Navigation Services to support the pilot in finding the next airfield. Therefore, a failure of a chart would not necessarily lead to an emergency.

- **Right of final authority of the pilot-in-command**

It is the duty and responsibility of a pilot to be prepared in case a failure of components of the aircraft should occur. This applies to the failure of an altimeter or the failure of a digital chart as well. As described above it is the obligation of the responsible pilot to assess which measures he has to take in case of any contingency, apart from his general legal obligation to take care. He is the responsible pilot and has the right of final decision. It happens that some pilots carry another portable radio transceiver with them just for the event that the fixed installed radio equipment on board fails. In the same way pilots, using only electronic charts could consider taking another power supply (battery) for the tablet PC with them.

Under the aspect of assessing the safety during the phase of planning and conducting a flight the dangerous moments certainly, do not occur because of a possible failure of the electronic chart. As long as the pilot while preparing his flight is taking all necessary precautions for the safe conduct of the flight, e.g. checking the tablet PC used for navigational purposes including the functionality and making sure that sufficient power supply is available for the whole duration of the flight, he meets the obligation mentioned above of not endangering life or property of others.

D. Conclusion and results

The relevant ICAO Standards and the corresponding binding legal regulations in the USA and EU as well do not preclude the use of the “Mobile FliteDeck VFR” and its charts for flight preparation and flight operations. They only refer to “information” which the pilot-in-command shall become familiar with before a flight. A statement through which kind of medium the pilot-in-command has to make this information available to him is not made. In particular, there is nothing said about a pilot meeting his obligation by using paper charts only.

So far the relevant ICAO standard or the corresponding binding legal regulations postulate only that the information has to be “appropriate for the intended operation”: Even if paper charts comply (with good reasons) with these requirements according to traditional views this does not mean that other media do not. They are equally useable, when they are as “appropriate” as paper charts.

The opinion about which kind of media is felt to be appropriate for flight preparation and -operation is up to the pilot-in-command. He has the right of final decision (authority) with keeping in mind maximizing avoidance of endangerment of life or property of others. The ruling criteria in this case are equal levels of safety compared to traditional paper charts with regard to substantial (content) and technical reliability.

The „Mobile FliteDeck VFR“ meets these criteria in all aspects. There is no doubt about the reliability of the contents, and there is no doubt about the technical reliability either. In particular the risk of a failure of the “Mobile FliteDeck VFR” is not higher than that of traditional paper charts, even when the risk has a different character. While the occurrence of a “failure” of latest information by paper charts is not unrealistic the risk of a technical failure of the “Mobile FliteDeck VFR” can be prevented by appropriate precautionary measures, like e.g. checking the tablet PC used for navigational purposes including its functionality and by ensuring sufficient power supply of the equipment used for the entire duration of the planned flight. Apart from that a failure of the „Mobile FliteDeck VFR” - in case it really happens – differs from a failure of any other technical equipment in an aircraft in that way that it does not create any immediate endangerment of life or property. Even more, the 28-day update cycle of the “Mobile FliteDeck VFR” is a clear advantage over the traditional paper charts.

Therefore the charts of Jeppesen’s “Mobile FliteDeck VFR“ fully meet the legal requirements of aeronautical charts used for flight preparation and flight operation.

The exclusive use of electronic charts of Jeppesen’s „Mobile FliteDeck VFR“ for the purpose of flight preparation and flight operation is legally allowed.