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INVESTIGATION OF THE DRAWBACKS OF THE CURRENT NOTAM SYSTEM

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Abstract. *The article deals with the analysis of the current NOTAM system, investigation of the factors that limit the NOTAM format, analysis of such drawbacks as human interpretation, information overload by the end use, geographical inaccuracy, not-self contained and hidden applicability.*
Keywords: hidden applicability; human interpretation; information overload; NOTAM format; not-self contained.

1. Introduction

Currently, the latest aeronautical information update means Notice to Airmen (NOTAM). A NOTAM is a notice, distributed by means of telecommunication, containing information about a change in aeronautical facilities, services, procedures or hazards, the timely knowledge of which is essential to personnel concerned with flight operations [Annex 15…2010].

The current NOTAM is a text note, which can be distributed by basic teletype networks such as Aeronautical Fixed Telecommunication Network (AFTN). The text is supposed to be read by pilots, controllers and other operational personnel that are involved in flight operations.

Basically the main purpose of NOTAM is the distribution of information in advance of the event to which it relates, except in the case that cannot be foreseen, for example unserviceabilities. Thus, to realize its purpose it must be received by the addressee in sufficient time for any required action to be taken. Each NOTAM must be transmitted as a single telecommunication message.

2. Classification of NOTAMs

All the NOTAMS may be classified as follows:

A — NOTAM containing information of concern to long- or medium-range flights, and given selected international distribution;

B — NOTAM containing full information on all aerodromes/heliports, facilities and procedures available for use in international civil aviation and given international distribution to adjacent States and other States on request;

C — NOTAM containing information of concern to aircraft other than those engaged in international civil aviation and given national distribution only;

S — NOTAM published in the SNOWTAM format concerning the presence or removal of hazardous conditions due to snow, slush or ice on aerodrome/heliport pavements or standing water associated with these conditions;

V — NOTAM published in the ASHTAM format concerning the occurrence of pre-eruption volcanic activity, or an operationally significant change in volcanic activity, the location, date and time of volcanic eruptions and horizontal and vertical extent of volcanic ash cloud, including direction of movement, flight levels and routes or portions of routes which could be affected;

Z — NOTAM concerning the status of elements of the Global Navigation Satellite System − GNSS [Doc.8126…2003].

The different types of NOTAM are identified by suffix letters 'N' (New), 'R' (Replacement) and 'C' (Cancellation). In such a way we have the following identifiers:

– NOTAMN (New NOTAM);
– NOTAMR (Replacement NOTAM);
– NOTAMC (Cancellation NOTAM).

The ICAO NOTAM format is strictly adhered to and the only NOTAM types allowed are NOTAMN, NOTAMR and NOTAMC.

3. NOTAM Format

One should understand that the NOTAM Format aim is to standardize the presentation of the different types of information published in NOTAM in order to enable understanding of the message by the addressee.

The NOTAM format essentially consists of two parts:

a) the part of interest to the communication service handling the AFS message, i.e. the part containing the priority indicator, addresses, date and time of filing and the originator's indicator;

b) the part containing the NOTAM information.

The NOTAM Format has been developed to facilitate its use in a manual or automated environment.

As such, it ensures compatibility between all AIS and NOTAM offices exchanging information on a worldwide basis.

Taking into account that many States have already automated their AIS and others are in the process of doing so, the importance of a compatible and comprehensive automated global system cannot be overestimated.

The international standard NOTAM format is contained in Annex 15 to the ICAO Convention [2010]. An example of NOTAM format is represented on the figure below (Figure).

The ICAO NOTAM format is strictly adhered to and the only NOTAM types allowed are NOTAMN, NOTAMR and NOTAMC.

NOTAM intended for international distribution includes English text for those parts expressed in plain language. It is not allowed to renumber the existing NOTAM (containing identical information, but with a new number). Renumbering at the beginning of each year is also not permitted. All published times is in UTC. NOTAM are basically qualified according to the NOTAM Selection Criteria (NSC) [EUROCONTROL…2009].

NOTAM format

There are several procedures for the creation of three NOTAM types. They are the following ones:

– NOTAMR must replace only one NOTAM. Both must belong to the same NOTAM series;

– NOTAMC must cancel only one NOTAM. Both must belong to the same NOTAM series;

– NOTAM must be cancelled only by a NOTAMC and never by a Checklist;

– For NOTAMR and NOTAMC, the date/time in Item B) must be equal to the actual date/time of creation of that NOTAMR and NOTAMC [EUROCONTROL…2009].

The following Table shows the necessary data Items for each NOTAM type and for the Checklist.

Necessary data for each NOTAM type and for the Checklist

Necessary data	NOTAMN	NOTAMR	NOTAMC	Checklist
Series/Nr/Type	Yes	Yes	Yes	Yes
Ref to Series/Nr	No	Yes	Yes	Yes
FIR	Yes	Yes	Yes	Yes
NOTAM Code	Yes	Yes	Yes	Yes
'Traffic'	Yes	Yes	Yes	Yes
'Purpose'	Yes	Yes	Yes	Yes
'Scope'	Yes	Yes	Yes	Yes
Lower/Upper	Yes	Yes	Yes	Yes
Lat/Long/Radius	Yes	Yes	Yes	Yes
Item A)	Yes	Yes	Yes	Yes
Item B)	Yes	Yes	Yes	Yes
Item C)	Yes	Yes	No	Yes
Item D)	Optional	Optional	No	No
Item E)	Yes	Yes	Yes	Yes
Item F & G	Optional	Optional	No	No

Yes   =   Entry in Item is compulsory.
No   =   Entry in Item is not allowed.
Optional =   Entry depending on the NOTAM contents.

We think that its format allows its usage for data processing as well as for presentation to users. First of all it contains basically all the necessary qualifiers to facilitate data retrieval by common query procedures and for sorting of information in accordance with user requirements.

As it has been already mentioned, NOTAM are collected and made available to the end users, in particular people involved in flight operations which are pilots, controllers. Typically, the presentation to the end user is in the form of Pre-flight Information Bulletins (PIB), which keeps the content and format of the original NOTAM messages. Usually NOTAM messages are filtered and sorted using the qualifiers of the "Q line", in particular location (airport/FIR), geographical position/radius of influence, vertical limits, purpose, and flight rule.

NOTAM can appear in various forms, for example, as an AFS message, on an input terminal or in a database. If to omit the communication text, a NOTAM has he following AFS format:

A1889/12 NOTAMN
Q)UKBV/QFMXX/IV/BO/A/000/999/5024NO3 027E005

A) UKKK B) 1211140900 C) PERM
E) MET SELF-BRIEFING PUT INTO OPERATION AT UKKK BRIEFING OFFICE. WORKING HOURS H24.

A0189/13 NOTAMN
Q)UKBV/QFAXX/IV/NBO/A/000/999/5024N03 027E005
A) UKKK B)1301020955 C) 1304032359
E) ILS RWY 08/26 LOCALIZER RELIABLE ONLY WITHIN 10 DEG EITHER SIDE OF CL.

4. The drawbacks of the current NOTAM format

We should understand that nowadays the NOTAM system is increasingly used for information which could affect the efficiency of the flight but that is not safety critical.

Still the current NOTAM format is limited by a number of factors, the most important of which are human interpretation, information overload for the end user, geographic inaccuracy, not self-contained and hidden applicability. Let's consider all of them more in details.

5. Human Interoperability

The ATM system is increasingly relying on automated systems at all levels, which depend on correct and up-to-date information in order to perform their functions. However, the content of a database, be it on-board, at the airport or in an ATC system, may be 'superseded by NOTAM'. The task of remembering which information is overridden becomes the pilot's or controller's burden. There is a risk that safety critical, last minute information remains outside the automated data processing chains and in consequence missed by some or all the actors involved.

The current system is driven by manual processes to ensure NOTAM accuracy and provide a way for humans to correct NOTAM entry errors. The system relies heavily on post-submission quality control. Although supposed to be human readable, there are frequent complains from pilots, especially from general aviation, that NOTAM text is frequently hard if not impossible to decipher for the non-expert.

The current concept of issuing safety critical information as free text is also inefficient, as it requires human reading and interpretation before being fed into the automated systems.

It's the same piece of text that is read by many recipients, who all do the same: read it, interpret it and input it in the database. This can significantly slow down the information flow.

It can also trigger misunderstandings, as shown by frequent discussions on AIS Agora (the on-line forum for AIS professionals), that ask for clarification with regard to the exact meaning of the words used in NOTAM.

6. Information Overload

As the information is becoming more and more dynamic the number of NOTAM published is increasing correspondingly. Today nearly 18,000 NOTAM are currently active all around the world. Many of these are given to flight crews for pre-flight briefing resulting in PIB in the range of 10-50 pages for an internal European flight.

But the information filtering capabilities of the text NOTAM are limited. As a result more than half of the information given in PIB has no direct impact on the flight for which it was provided. And in such a way I think it increases the probability of pilots not being aware of important NOTAM.

7. Geographic Inaccuracy

Aeronautical information is usually geographically related and even of geometrical expression (airport surfaces, routes, airspace, etc.). The part of the NOTAM message that can today be interpreted automatically is limited to "position and radius of influence". This seriously reduces the possibility to present the NOTAM information graphically. Currently the NOTAM originators tend to overestimate the radius of influence, which causes the NOTAM to be included in briefings for flights that are totally outside the really impacted area. And again we have the situation when a pilot for example receives NOTAM that have no direct impact on his flight.

8. Not self-contained

Another fact that should be considered is that there are cases when NOTAM are not self-contained but refer to an AIP Supplement, which is not always applicable to the route of intended flight. Thus there is another drawback of current NOTAM system. Due to the complexity of airspace, databases, and publishing errors, there is a tendency to use the NOTAM system as a correctional medium providing the users with data which actually degrades safety.

9. Hidden Applicability

NOTAM can contain applicability schedules such as area active "APR 14 1200-1250 1300-1350 2000-2050, 16 0800-0850 0900-0950 1200-1250, …". Such schedules are based on the human interpretation which is almost impossible for automated systems. At the same time they are hard to read and sometimes even ambiguous. And for the cases when supplementary applicability information is provided in the free text description, it makes the interpretation even more difficult.

Another aspect is that today the NOTAM publisher estimates the radius of impact of a NOTAM. It is a single value "one size fits all", which is I think not an efficient approach, but it's the only possibility that we have today, with the NOTAM text.

The status of the route network (active restrictions, temporary open routes, traffic flow restrictions) are currently published via a mixture of NOTAM and more dedicated "network messages" (AUP/UUP, etc.). This multitude of formats makes it difficult for the end user to use the information.

The current NOTAM messages are difficult to read and interpret for the VFR flying community. For example, NOTAM can announce temporary restricted areas and which the pilot needs to manually plot on a map in order to evaluate the impact on the flight trajectory. This is very time consuming and error prone, which often results in airspace infringements.

10. Conclusions

The current NOTAM system has a lot of drawbacks. First of all taking into account the fact that ATM system is becoming totally automated, NOTAM still requires human intervention. It is driven by manual process but at the same time remains difficult to be read by the users. Secondly a great part of the information often does not have a direct impact on certain flight that causes pilots not awareness in the necessary information. Such situation may greatly reduce the safety of the flights.

One of the main goals of the future ATM system is the information sharing, meaning permanent access to the relevant information by all the users. It is clear that the current NOTAM messages and similar text messages, containing safety critical information, cannot satisfy the future ATM system.

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Розглянуто існуючу систему NOTAM. Наведено формат NOTAM. Проаналізовано основні недоліки існуючої системи NOTAM.

Ключові слова: інтерпретація людиною; неавтономність; перевантаження інформацією; приховане застосування; формат NOTAM.

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Рассмотрена существующая система NOTAM. Приведен формат NOTAM. Проанализированы основные недостатки существующей системы NOTAM.

Ключевые слова: интерпретация человеком; неавтономность; перегрузка информацией; скрытая применяемость; формат NOTAM.

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