

ENHANCED PILOT SITUATIONAL AWARENESS THROUGH THE DIGITAL/GRAFICAL PRE-FLIGHT BRIEFING CONCEPT

or “from smoke signals to the digital pre-flight briefing concept”

by Renée Pelchen-Medwed and Eduard Porosnicu

THE TELEPRINTER MACHINES IN THE 1920'S SUPPORTED ONLY UPPER CASE LETTERS AND THIS IS THE REASON WHY SOME PILOTS TODAY STILL HAVE TO GO THROUGH NUMBERLESS PAGES OF NOT USER FRIENDLY NOTAM FULL OF ABBREVIATIONS LIKE CLSD RWY 24L TEMPORARY DISPLACED THRESHOLD PAPI GA 3 ETC.

Not only is reading text like this not very user-friendly, it also brings the risk of misinterpretation and can even lead to dangerous situations. Accident reports sometimes identify a failure to review, properly understand and/or recall NOTAM information correctly as a contributing factor, for example in the attempted take off from a closed runway at Taipei by a Boeing 747 in 2000¹. An analysis of investigation reports on aircraft accidents indicates that the format of the briefing documents can make the extraction of key information difficult. A pilot must be able to easily

obtain comprehensible information relevant to his flight to help establish the necessary situational awareness. Relevant information will include data about the route to be flown, about the departure, destination and alternate airports and weather information, both observed and forecasted.

The means that gives the pilot this overview and provides situational awareness during the pre-flight briefing is the generic Pre-flight Information Bulletin (PIB) along with separate MET Charts, Forecasts and

Reports. A Pre-Flight Information Bulletin (PIB) contains details of current NOTAM for a specified area or along the route. A NOTAM is defined by ICAO as “a notice distributed by means of telecommunication containing information concerning the establishment, condition or change in any aeronautical facility, service, procedure or hazard, the timely knowledge of which is essential to personnel concerned with flight operations”. And it is this “means of telecommunication” that still determines the format of the NOTAM at initial issue. NOTAM have

PRE-FLIGHT INFORMATION BUL

1- see http://www.skybrary.aero/index.php/B744,_Taipei,_Taiwan,_2000

retained the all-uppercase letters only and abbreviations that were needed for the Teletype machines of the 1920s that could only transmit limited information. However, despite tremendous developments in communications technology in recent decades, only very small advancements have been made in improving the usability and user-friendliness of the NOTAM system. It should also be noted that there is a significant increase in the number of NOTAM issued around the world, which has grown from around 300 000 in 2000 to more than 1.1 million in 2015. This leads to visibly longer and more complex PIB documents for pilots.

Studies recommending improvements are not new, but only since 2010, when the concept of the Digital NOTAM was defined, things have started to progress. No longer does a NOTAM need to be a hard copy text notification. Instead it arrives in a format which can be transformed, analysed and presented to the end user in a form tailored to their specific needs. The availability of Digital NOTAM will enable a complete rethink of the presentation of pre-flight information bulletins. This overdue modernisation can address safety recommendations from accident investigations concerning the need for better NOTAM clarity - in particular annotated graphics in place of text with location described by coordinates or text descriptions. "A picture is worth a thousand words"....

++ DE-ICING PROCESS EXPERIMENT UPON SOME TERMINALS
2D AND 2F1 ACFT STANDS
FROM: 17 JAN 2011 06:00 TO: 15 MAY 2011 23:59 (A0217/11)

++ THE DE-ICING AND ANTI-ICING PROCESS SHOULD BE MODIFIED AS FOLLOWS-CONFIRMATION ON DE-ICING FREQUENCIES:
- DE-ICING/ANTI-ICING IN ONE PHASE:
SPRAYING OF TYPE I PRODUCT (BRAND 'CLARIANT SAFEWING MPII1938 ECO(80)' OR ' ABAX DE950') MELTING OF FLUID AND WATER
- DE-ICING/ANTI-ICING IN TWO PHASES:
SPRAYING OF TYPE I PRODUCT WITH MIXED FLUID/WATER FOLLOWED WITH APPLICATION OF TYPE II PRODUCT AT 100 PER CENT CONCENTRATION (BRAND'CLARIANT SAFEWING MPII FLIGHT FROM: 22 JAN 2011 05:00 TO: 15 MAY 2011 23:59 (A0329/11)

++ LOCATOR RSY 356 KHZ, RSO 364 KHZ OUT OF SERVICE
FROM: 01 APR 2011 08:00 TO: 30 NOV 2011 16:00 (A1550/11)

++ NOTAM SUBJECT TO QUERY RADIO NAVIGATION AIDS TO BE CONFIRMED NDB CGZ 370KHZ, CGO 399.5 KHZ OUT OF SERVICE
FROM: 01 APR 2011 08:00 TO: 30 NOV 2011 16:00 (A1551/11)

++ TRIGGER NOTAM- AIRAC AIP SUP 018/11 IN FORCE ON 2011 APR 07TH, WORKS ON ACFT STANDS.AVBL ON WWW.SIA.AVIATION-CIVILE.GOUV.FR
FROM: 07 APR 2011 00:00 TO: 16 DEC 2011 23:59 (A0909/11)

++ TRIGGER NOTAM - AIR SUP 021/11 IN FORCE ON APRIL 07, 2011 : WORKS FOR TWY U AND C COMPLIANCE, CURRENT PHASE : PHASE 1.
AIR SUP AVAILABLE ON WWW.SIA.AVIATION-CIVILE.GOUV.FR
FROM: 07 APR 2011 04:00 TO: 26 JUN 2011 04:00 (A0912/11)

++ TRIGGER NOTAM - AIP SUP 020/11 IN FORCE ON APRIL 10TH, 2011 : PREPARATORY WORKS IN ORDER TO MODIFY THRESHOLD 08L : DURING THIS PERIOD, TAXIWAYS UN, UC1, UC2, UC3 AND U BETWEEN N AND UC3 INCLUSIVE ARE CLOSED H24
AIR SUP AVAILABLE ON WWW.SIA.AVIATION-CIVILE.GOUV.FR
RMK: CHANGE OF WORK ENDING DAY 09 MAY 15H00 INSTEAD OF 10 MAY 0600.
FROM: 06 MAY 2011 11:31 TO: 10 MAY 2011 06:00 (A2253/11)

AERODROME (ALTERNATES)

EBBR - BRUSSELS/BRUSSELS-NATIONAL

- PILOTS SHALL REQUEST START-UP BTN TSAT MINUS 5 MIN AND TSAT PLUS 5 MIN. EARLY REQUESTS WITHOUT FPL UPDATES ONLY AS OF EOBT MINUS 15 MIN AND ONLY AFTER PRIOR PILOT CHECK ON ALL DOORS CLSD AND PUSHBACK AVAILABLE OR PRESENT AT THE ACFT.
FROM: 05 JUL 2010 15:10 TO: PERM (A1436/10)

+ ACFT STAND TAXILANE STRIP 1 CLSD DUE TO WIP
FROM: 28 MAR 2011 06:00 TO: 30 JUN 2011 15:00 (A0476/11)

+ ALS CAT I RWY 02 MISSING BARETTE 390M FM THR
FROM: 31 MAR 2011 21:30 TO: 30 JUN 2011 14:00 (A0512/11)

+ ACFT STANDS 305, 306, 307, 421, 422, 423 AND 424 CLOSED DUE TO WIP.
FROM: 05 APR 2011 07:55 TO: 01 JUL 2011 15:00 (A0526/11)

+ WESTERN PART TWY N2 ABEAN ACFT STAND 906 ONLY AVBL FOR ACFT ON TOW MAX.WINGSSPAN 45M. CL DISPLACED 25M TO THE NORTH
FROM: 26 APR 2011 05:00 TO: 16 MAY 2011 15:00 (A0688/11)

+ ALL ACFT DEPARTING FM APRON 9 SHALL BE PUSHED ON TO TWY N2 FACING EAST ABEAN ACFT STAND 903 OR FURTHER EAST. PUSHBACK DISCONNECTION AND ENGINE START UP ONLY ALLOWED FM THIS POSITION.

Figure 1 The NOTAM page of a traditional PIB

Within the frame of SESAR, the Aeronautical Information Management (AIM) project has recently held its final validation exercise of the digital/graphical pre-flight briefing concept. The exercise was supported by an enhanced Pre-flight Information Bulletin or "ePIB" developed to meet requirements identified in the last three years by the project partners (Frequentis, EUROCONTROL, ENAV,

NORACON, DFS and Thales), with the direct involvement of some 'customers' (pilots and dispatchers). The requirements included graphical presentation of information, organisation of information per phase of flight, highlighting information events that are of particular importance and the use of normal sentence case for the text. Most of these ideas have been implemented in the prototype and validated

BULLETIN



FREQUENTIS Integrated Digital Briefing

Overview | Settings | Flight Plans

16-02-17 15:30 TEST01 KJFK - LOWW

Departure Airport : KJFK

Time filter: 16-02-17 14:30 to 16-02-17 16:30 | Edit

1 TWY Closure 16Jan18 14:00 to 16Jun01 23:00 A0296/18

2 TWY Closure 16Jan18 14:00 to 16Jun01 23:00 A0296/18

3 TWY Closure 16Jan18 14:00 to 16Jun01 23:00 A0294/18

4 TWY Closure 16Jan18 14:00 to 16Jun01 23:00 A0296/18

5 TWY Closure 16Jan22 05:10 to 16Jun01 23:00 A1388/18

6 OTHER 15May05 20:10 to 99Dec31 09:00 A4415/18

7 RWY 22L engineered materials arresting system not STD 16Jan17 23:45 to 16Jun01 23:00 A0286/18

8 OTHER 15Nov05 05:25 to 16Jun01 23:00 A0166/18

9 RWY 22R PAPI commissioned 16Jan17 19:06 to 16Jun01 23:00 A7034/18

10 OTHER 15May05 20:10 to 99Dec31 09:00 A4415/18

11 RWY 31R holding position markings at RWY 04L/22R SE side obsd. (comes from Event text) 15May05 20:10 to 16Jun01 23:00 A4415/18

12 RWY 31R holding position markings at RWY 04L/22R SE side obsd. (comes from Airport/Heliport annotation) 15May05 20:10 to 16Jun01 23:00 A4415/18

13 Lendy arrival...Unusable below 4000FT 15Jan22 00:28 to 16Jun01 23:00 A0634/18

14 Runway centreline lights RWY 03/21 spacing changed to 15M. 16Jan17 23:22 to 16Jun01 23:00 A0281/18

15 RWY 13R/31L wet deiced liquid and deiced solid observed at 1601172122. 16Jan17 23:15 to 16Jun01 23:00 A0280/18

16 RWY 04R/22L wet deiced liquid and deiced solid observed at 1601172115. 16Jan17 23:45 to 16Jun01 23:00 A0284/18

17 RWY 04L/22R wet deiced liquid and deiced solid observed at 1601172145. 15Dec30 17:35 to 16Jun01 23:00 A0408/18

18 RWY 22R PAPI beyond 8 deg right of rcl unusable 16Jan17 15:06 to 16Jun01 23:00 A4157/18

19 RWY 22L PAPI relocated left side (event annotation) 15Dec02 17:00 to 16Jun01 23:00 A8773/18

20 RWY 22R PAPI relocated left side (apt annotation) 15Dec02 17:00 to 16Jun01 23:00 A8773/18

21 OTHER Runway status lights (rwl) are in an operational test and must be complied with. Runway status lights are red in-pavement lights that serve as warning lights on runways and taxiways indicating that it is unsafe to enter, cross, or begin takeoff on a runway. Note: runway status lights indicate runway status only. They do not indicate clearance. Pilots and vehicle operators must still receive a clearance from air traffic control before proceeding. For additional information visit: <http://www.Faa.Gov/air/Traffic/technology/rwl> 15Dec02 17:00 to 16Jun01 23:00 A8773/18

Figure 2 - The ePIB prototype presenting NOTAM on the right side of the picture with the graphical representation of an airport map

through real time simulations. The ePIB prototype also included the option to lookup the meaning of abbreviations.

RENÉE PELCHEN- MEDWED

works as a Human Performance Expert at Eurocontrol HQ in Brussels. She is a registered Aviation Psychologist with more than 15 years of practical experience in the aviation industry. She joined EUROCONTROL CRDS Budapest in 2003 where she worked as a validation and human factors specialist. Since 2010 she mainly provides human performance support to various operational and technical SESAR projects.



One of the objectives of these real-time simulations was to provide the pilot with improved situational awareness of the status and condition of airports, airspace and the CNS environment. The validation exercise simulated an Airport Briefing Office where pilots performed a pre-flight briefing using the ePIB prototype. The Digital NOTAM included in the prototype was selected automatically based on their flight planned route including departure, arrival and alternate aerodromes and the intended departure time. The ePIB prototype also aimed to improve the pilot situational awareness of the current operating situation beyond NOTAM by integrating MET data. To be able to compare the improvements of the ePIB over the historical alternative, both scenarios were included in the validation exercise.

Examples of relevant information which would not be known pre flight except through a briefing were included in the validation exercise to see if they were more

easily detected using the ePIB process. Such examples included:

- Alerts to erroneous data for the arrival airport (displaced threshold/wrong coordinate decimals)
- A SNOWTAM combined with a closed runway
- Closed taxiways and other relevant events, such as temporary obstacles at the departure airport
- Combined MET and NOTAM information in en-route phase (SIGMET and active military area)

Pilots involved in the validation exercise were invited to review information presented through both the PIB and ePIB method and assess its importance and its consequence for their planned flight. This was done by presenting them with information examples like those above with three minutes to make their assessment for each version - the traditional PIB and the ePIB. Directly after being presented with one version, structured interviews

were conducted with them to elicit their feedback. One of the questions they were asked was if they had detected an information example in both formats, how easy it was to detect it in each one and assess if it was relevant to their intended flight.

The results confirmed the expected benefits of the ePIB. This method resulted in all the information examples being detected whereas this was not the case with the traditional PIB so situational awareness was improved by the ePIB. All participants agreed that the ePIB was the better method of providing information and that the graphical representation of events using colour coding and symbols on an airport map and integration of en-route AIS and MET information was useful. An uncontroversial benefit was the display of the NOTAM in a normal case format.

Of course, this was a prototype, so although it was clear that whilst the ePIB brought many advantages for the pilot, there were still quite a lot of improvements needed

including more information on airport maps such as runway and taxiway identification. The need for standardising the graphical presentation of events such as runway closure, navaid unserviceable, airspace reservations, etc. was also identified. A first step in this domain was made by SAE International, which has released a first version of a Recommended Practice (ARP6467) for "Human Factors Minimum Requirements and Recommendations for the Flight Deck Display of Data Linked Notices to Airmen (NOTAM)". More standardisation efforts are envisaged for the coming years.

The successful completion of this validation, complemented by other validation exercises carried out by SABRE and Honeywell, opens the way for the operational deployment of the ePIB. Soon, pilots will no longer have to read endless lists of NOTAM in upper case, but will be able to consult well-structured integrated AIS and MET information supported by graphical presentations. This



EDUARD POROSNICU

Working in EUROCONTROL since 1998 in the Aeronautical Information Management area. Previously worked in the Romania CAA, involved in AIS and procedure design activities. Current responsibilities include the development of automation specifications, in particular the Aeronautical Information Exchange Model (AIXM) and Digital NOTAM. Leading the SESAR AIM Operational Focus Area, which includes in particular the Digital Integrated Briefing project.

will enhance pilots' situational awareness by helping them detect and easily understand the specific information they need and should greatly reduce misunderstanding and misinterpretation. 



Figure 3 - picture showing the possible lengths of traditional Pre-flight Information Bulletins