

THE INFLUENCE OF PRE-FLIGHT BRIEFINGS ON FLIGHT SAFETY

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Abstract: *This paper reveals the importance of pre-flight briefings and discusses the details of conducting effective briefings. It provides guideline about how to organize and conduct efficient pre-flight briefings. The study illustrates the fact that pre-flight briefings constitutes an important part of the flight and may considerable influence the flight safety. It is essential to conduct effective briefings. Only with a proper preparation the crew members will have the necessary abilities to fly at a maximum effectiveness and safety. Briefings should be conducted at different points of the flight, before take-off endless to the arrival gate and even after landing through debriefings.*

Briefings should help all the crew members to understand the logical sequence of events and activities, as well as the state of the aircraft and any special hazards or facts involved in the planned flight sequence. In order to achieved the safety and advantages of standard flight preparation, all crewmembers should take actions for high-quality briefings.

The study concluded that the flight safety is significantly increased through a compliant briefing.

Keywords: *briefing, flight safety, meteorological briefings*

1. INTRODUCTION

Flight briefing is part of the crossover from normal life to the highly active environment of flight. Being an essential part of the flight preparation the briefings are an essential moments for the team building, for the establishment of the leader and a good opportunity to study all the operational data applicable to the flight.

The important parts of pre-flight planning involve[8,11] checking flight information publications, aviation weather reports and determining airplane performance, including the computation of weight and balance and fuel requirements. The influence of altitude, temperature and wind should not be ignored and the pilots should be familiar with the pressure and density altitudes and the effect that they have on aircraft performance [4,6,7,8]. They have to verify the runway length and compare that to their takeoff requirements and the rotational and initial climb speeds recommended in the airplane's manual (POH).

In order to ensure a good cooperation and collaboration between members of the crew and to apply efficient the CRM, briefings should be conducted before each flight. Each crew member should remember that briefings are standardized and they should ignore the fact that a part of the team is familiar with the route, the flight plan or with each other.

This moment is one of the most crucial moments for building-up the synergy, because critical and expandable decisions are made (e.g. loading, fuel quantity, de-icing, diversions en-route).

At the end of pre-flight briefing the crew should have clearly define a mental model of the possible hazards that may arise in condition of normal operations and a mental model of flight plan. Also, the crew should know the procedures that will be use in case of unexpected events during the flight. During the pre-flight briefing, the following objective should be accomplished:

- Set out and communicate the plans of actions and expectation in normal and abnormal conditions;
- Establish practical task sharing (i.e. responsibilities' and duties' of members of the crew);
- Sum up each aspect to its appropriate details' level;
- Bear up questioning and feedback;
- Assure a good and complete understanding and assent of the correct sequence of action;
- Convey to other crewmembers the objectives and amplify the synergy;
- Improve the flight crew preparation for unusual flight conditions or responding to unforeseen conditions.

The quality of the pre-flight briefings forge crew performance throughout the flight. The pre-flight briefing starts at the office of the flight dispatches, when the crew receives the flight plan documentation.

At this stage the preflight briefing should include:

- Acquaintance with airports (departure, arrival, alternates airports) and routes;
- Aircraft state of maintenance ;
- Meteorological conditions for takeoff, landing (e.g. runway conditions, significant weather);
- Fatigue state of each member of the crew;
- Communications;
- Information about the status of the cabin;
- Abnormal procedures (e.g. rejected takeoff, diversion, missed approach);
- Reviews and discussions about takeoff and departures risks.

2. TECHNIQUES FOR CONDUCTING EFFECTIVE BRIEFINGS

Unfortunately, it is often happening to underestimate the importance of briefing techniques[9,12]. Interactive briefing are significant and recommended because they offers the crewmembers the opportunity to communicate, to check, and/or correct as necessary.

The briefing itself should be develop on the logical sequence of flight phases. Moreover, it is very important to avoid the routine and formal repetition of the same points on each sector, because it is often become counterproductive[1,2].

During briefings the speaking should be face-to-face, while the pilots has to remain cautious and vigilant in the monitoring the aircraft and flight progress. The briefing techniques of the captain should encourage effective listening to attract the copilots' attention. There are situations when the crew has to review the significant parts of the previously briefings (e.g. ATC clearance, significant weather, aircraft conditions). These are situations when a re-briefing is adequate.

Nowadays the importance of pre-flight briefing is emphasized from the beginning of pilots training programs within ATOs and military schools[1,2,5], along with a Safety Management System. The future pilots should be aware from initial training program about the influence of the pre-flight briefing on the flight safety.

3. METEOROLOGICAL DOCUMENTATION

A very important part of pre-flight planning is obtaining weather information. It is important to discuss the effects of significant weather conditions on flight. This is not important only for safety reasons but also because being informed about the weather conditions it will decrease the time of reaction.

All weather forecasts are results of the mathematical and statistical models and the pilots should be able to interpret them correctly. Crews must use their knowledge, skills and attitude, together with their experience in meteorological patterns and brief each other concerning atmospheric hazards.

Meteorological information for pre-flight planning and in-flight re-planning shall include any or all of the following information[4,5,6,9,12]:

- a) current and forecast parameters (e.g. upper winds, upper-air temperatures);
- b) tropopause height and maximum wind (e.g. direction, speed);
- c) significant en-route weather phenomena and amendments;
- d) take-off forecast;
- e) METAR/SPECI (including landing forecasts) for departure, alternate, destination aerodromes;
- f) TAF and amendments there to for departure, alternate, destination aerodromes;
- g) SIGMET information and appropriate special air-reports;
- h) AIRMET information for low-level flights;

Usually, each important airport have a briefing facility. However the pilot is able to interpret the information provided without help. In many countries, an aviation meteorological briefing can be obtained on-line, either in association with the aeronautical information briefing, or separately.

For example, in Romania, ROMATSA offers an Aeronautical Information Portal (<http://flightplan.romatsa.ro/init/meteo>). This portal, Fig.1. presents detailed information about the parameters necessary for flights, charts, radar and satellite images.

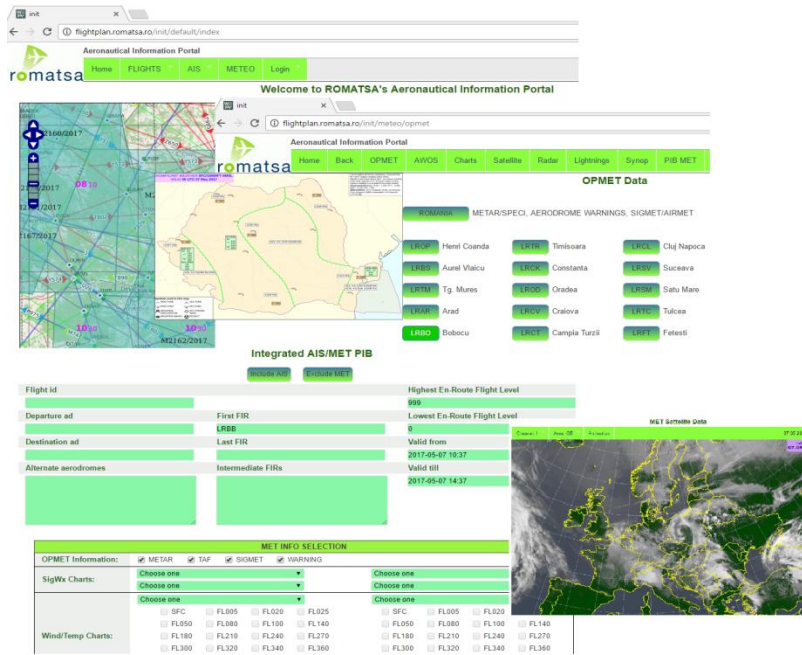


FIG. 1. Brief preview of ROMATSA portal[10]

The standard weather briefing is depicted in Fig. 2. and emphasize the equal importance of all sections included.

According to National Transportation Safety Board – Office of Aviation Safety (NTSB)[11] between 2000 and 2011 were reported 19,441 accidents and 29% of them are weather related. The table 1. and the Fig.3. emphasize the previous information. The same source has informed that in 41% of this weather related accidents the pilots did not obtain, receive or interpret correct the weather documentation.

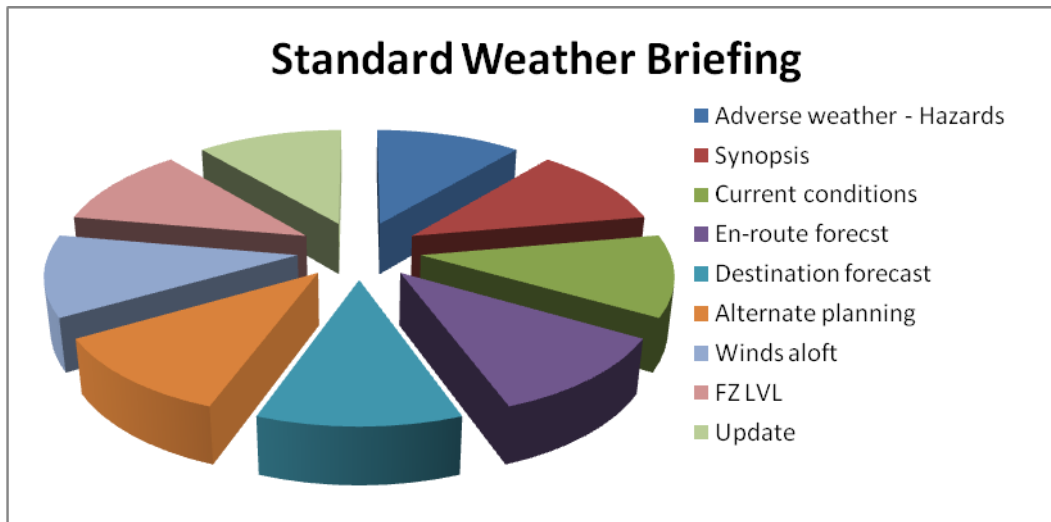


FIG. 2. Standard weather briefing components

Table1. NTSB statistics between 2000 and 2011

NTSB ACCIDENT STATISTICS (19,441 accidents) between 2000-2011	
ACCIDENTS	71%
WX RELATED	29%

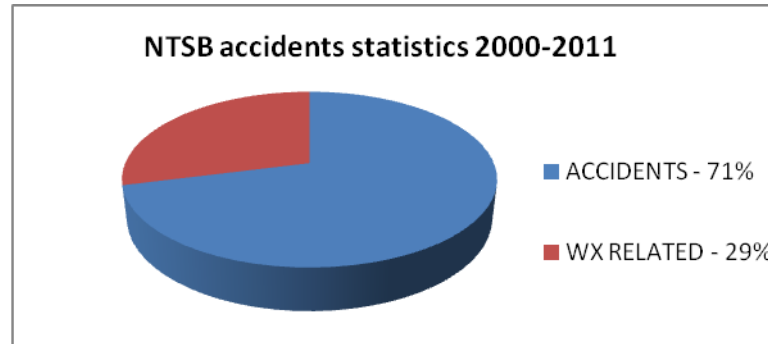


FIG. 3. Standard weather briefing components

The significant weather phenomena are frequently associated with root cause of aircraft accidents or they may be a factor that significantly contributes accidents generation. The analyses of accidents have revealed that adverse wind was the main factor with such a contribution having a 52%. The list[4,11] also includes low visibility (13%), density altitude (6%), carburetor icing (6%), up/downdraughts (4%), clouds (4%), structural icing (3%), turbulence (3%), thunderstorms (2%), sand storm/dust devils (1).

4. PRE-FLIGHT BRIEFING CALCULATIONS

After the analysis of the meteorological documentation has been carried out it is necessary to complete the flight planning calculations, the flight log, the weight and balance calculations and flight plan. A very good pre-flight briefing will significantly increase the flight safety and the potential of the crew members. All the calculations should be done in accordance with the Pilot Operating Handbook (POH)[8].

4.1 Flight planning.

Compass Heading:

$$TC + / - WCA = TH + / - VAR = MH + / - DEV = CH \quad (1)$$

Where CH represents[8,11] the Compass Heading, TC represents True Course, WCA represents the Wind Correction, TH represents True Heading, VAR represents Variation, MH represents Magnetic Heading and DEV represents Deviation.

Estimated time En-route (ETE):

$$Time = Dist. / Speed \quad (2)$$

Weight Shift problems:

$$Dist. weights hifted \times weightshifted = total weight \times change \text{ of } C \text{ of } G \quad (3)$$

Track error (1 in 60 rule):

$$TE = \left(\frac{60}{\text{Dist. flown}} \right) \times \text{dist. from the track} \quad (4)$$

Closing angle (1 in 60 rule) :

$$CA = \left(\frac{60}{\text{Dist. to go}} \right) \times \text{Dist. from the track} \quad (5)$$

4.2 Aerodynamics[3]

Load factor:

$$G = \frac{1}{\cos(\text{bank angle})} \quad (6)$$

Higher stall speed in a turn:

$$V_{sacc} = V_s \times \sqrt{\text{load factor}} \quad (7)$$

Increased Stall Speed at higher weight:

$$V_{s \text{ new}} = V_{s \text{ old weight}} \times \sqrt{\frac{\text{new weight}}{\text{old weight}}} \quad (8)$$

Lift:

$$L = \frac{1}{2} \rho v^2 \times S \times C_L = IAS \times C_L \quad (9)$$

Dynamic pressure:

$$IAS = \frac{1}{2} \rho v^2 \quad (10)$$

True Airspeed:

$$TAS = IAS \times \sqrt{\frac{\rho_0}{\rho}} \quad (11)$$

Propeller Efficiency:

$$PE = \text{Thrust} \times TAS / \text{Brake Horse Power} \quad (12)$$

4.3 Aircraft performance.

Pressure Lapse Rate:

$$PLR = 96 \times T/p \quad (13)$$

Where T is the temperature in Kelvin and p is the local pressure expressed in hPa.

Pressure Altitude:

$$\text{Pressure Altitude} = \text{Altitude} + (1013 - QNH) \times 27 \quad (14)$$

Density Altitude:

$$\text{Density Altitude} = \text{Pressure Altitude} + (OAT - t_{ISA}) \times 120 \quad (15)$$

Specific Air Range (SAR):

$$SAR = \left(\frac{TAS}{power} \right) \times \left(\frac{1}{SFC} \right) \quad (16)$$

Specific Ground Range (SGR):

$$SGR = \left(\frac{GS}{fuel\ flow} \right) = GS/power \quad (17)$$

Best Specific Fuel Consumption (SFC):

$$SFC = \frac{TAS}{power} \quad (18)$$

CONCLUSIONS

Due the fact that a good pre-flight briefing significantly increase the flight safety it becomes mandatory for each pilot to accomplish a standardized pre-flight briefing according to the international/national recommendations, rules and regulations. A special attention should be payed to the meteorological parameters, which may change during the flight.

Conducting efficient briefings is the most important part of flight preparation. Without standardized preparation, a crew will not have the adequate situational awareness to fly at maximum performance and safety. Briefings are necessary at different points in the flight from departure runway through the arrival gate.

The essential points to apply to all briefings are:

- Briefings should be applicable to the flight conditions and focus on the items that are relevant for flight.
- Briefings should be interactive and allow for dialogue between the captain, copilot and rest of the crewmembers.

- Briefings should be done during low-workload periods.
- Briefings should be done even if the crew has completed the same flight many times in the past.
 - Briefings should cover abnormal procedures.
 - Pilots should not focus on one particular aspect of information in a briefing, because important information may be missed.

The de-briefing also play an important role in pilots training and it may contribute to a very good personal development of the crew members.

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