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PROPOSAL OF MCC COURSE TRAINING MANUAL FOR L410 AIRCRAFT

NÁVRH MCC VÝCVIKOVEJ PRÍRUČKY PRE LIETADLO L410

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Abstract

Subject of this paper is to propose a possible and notably practically useful training manual for multicrew cooperation training directly suited for use on L-410 airplane type simulator. This paper could be used as study material at LVVC or any other organisation providing MCC training on L-410 aircraft type simulator. Whole paper is divided into three parts: introduction, core and conclusion. Introduction can be understood as a proposition of a problem and determination of paper goals. In its core part, this paper is going to explain the current state of training, legislative issues, technical solutions, analyse possibilities and practical use of this proposed manual. Lastly, there will be evaluation of this topic in conclusion.

Keywords

Analysis, MCC, L410, Manual, Training course

1. Introduction

As we all know the importance of well-trained pilot in a commercial aviation environment is absolutely necessary, his piloting skills must be at the highest level of efficiency, consistency and accuracy, we cannot forget about his absolutely vital managing skills in a multicrew cockpit. His strong and independent decisions must come from an adequate decision-making process which is conditioned to his throughout training. Moreover, sometimes working according to predetermined procedures which then lead to an important action is more desirable than just flying alone. Which sets an essential role on pilot cooperation training in the aviation industry.

One could say that avoiding dangerous or potentially risky situations during a flight is sometimes inevitable, thus correct and rigorous training for coping with such situations with another pilot is highly appreciated. If such an event would ever occur it is essential for pilots to use right cooperative skills and are able to conclude correct decisions eighter on their own but mostly through cooperative thinking process with their colleague.

Although historically, flying was firstly considered as “one-man-show.” That means only one man could fly an aircraft. Moreover, the first Wright Flyer had only one “seat.” After that, most of the pioneer aircraft flew with one pilot since their inability to carry heavier payload was at that time significant. Despite these humble origins’ aviation technology registered a swift progression which cannot be stopped even today. Furthermore, the evolution and forward working is quicker than it was twenty or thirty years ago mainly because of advanced technology today. Similar to progression in technology, the need for more operations during the flight arose accordingly with more advanced aircraft. This meant a change in cockpit operation was necessary and a role of second pilot was introduced. Flight duties were divided for captains and first officers. Although, this was such a big step forward there were a lot of hierarchy problems. Captains were considered as infallible as ship captains and first officers had only a small status.

Thankfully, this has changed during the years also thanks to implementation of Multi crew cooperation training. Nowadays cockpits are dynamic working places where captains and first officers are at the same level and their annotations, observations and ideas on how to fly safely and more efficiently are considered of equal value. Procedures are encouraging both pilots in symbiotic cooperation which leads to a smoother workflow with less possibilities to make a mistake. One could say this teamwork is less prone to mistakes too because of two-way work crosschecking between pilots.

Multi crew cooperation training is therefore one of the most important parts of proper flight training for young pilots who want to become professional airline pilots one day.

2. Background and state of the art

Every good flight school tries to provide the best possible solutions for its students. The same is valid for LVVC. This flight school which operates under Žilina university in Žilina is known as a pedagogical institute with one main purpose. To provide theoretical and practical flight training in the best possible circumstances and with the best equipment that money can buy.

In accordance with approved training organisation license (SK.ATO.01), LVVC provides a practical route to the cockpit by continual "integrated ATP flight training course" or by set of "modular training courses" while keeping CRM always in mind. Organisation also provides ICAO English level assessment and theoretical ATPL certification in partnership with the Aviation exam program. In every possible type of flight training provided by LVVC a big emphasis is on safety and liability in aviation. To help students to get used to such measures a program of managing threats and errors is used throughout every aspect of the learning and flying process. Lastly, at the end of the program each student will undergo a skill test to ensure he/she understand all aspects of training.

Good name and high quality can be seen in numbers too. Through the history of flight training at LVVC more than 110000 student flight hours have been flown, hundreds of CPL commercial pilots have been certified with licenses valid for instrument rating IR(A), single-engine SEP(L) and multi-engine MEP(L) capacity and have been provided with theoretical knowledge up to "frozen ATPL" level.

2.1. Let L-410 FNTP II / FTD /FFS Flight Simulator

The base for this paper and an actual merit for MCC training is foremost the flight simulator which is going to be used. Particularly, this flight simulator resembles actual cockpit from L-410 aircraft type UVP-E20. This airplane is a twin-engine, turbo-propeller driven, short range transport aircraft manufactured by Czech aircraft manufacturer Let Kunovice.

The Flight Simulator for LET-410 UVP-E20 aircraft represents a reliable and cost-effective flight training device. The system is designed for VFR/IFR training, cockpit procedures and conditional training, recurrent training and type rating. The simulator consists of realistic dual-seat pilot cockpit and of an instructor operating station. The cockpit can be modified under requirements of the customer and airplane version and

Figure 1: L-410 Flight simulator at UNIZA. Source: FB Zall Letov Simulators.

modification from older version L410 UVP up to UVP-E20 versions provided with EFIS/glass cockpit certified from FNPT II MCC or FTD level by EASA/FAA authorities, collimated visualisation or standard 3 channel HD projection and many optional modules (TCAS, weather radar etc). [2] This simulator was built by Czech company called Zall Letov Simulatory, s.r.o.

Specific system which is installed in LVVC was certified by Slovak Transportation Authority on May the 8th, 2018 for the level of FNTP II MCC. This particular simulator is provided with EFI Universal 890R configuration.

Figure 2: L-410 Flight simulator cockpit view. Source: FB Zall Letov Simulators.

3. Theoretical framework

Multi crew cooperation means the functioning of the flight crew as a synchronized group which consists of coactive members led by the pilot-in-command (PIC). Main purpose of this paper as an integral document is to provide theoretical background, practically useful manual and foremost to become a study material for pilot trainees who are going to complete this training at LVVC, particularly on flight simulator for L410 airplane. Paper is going to have throughout description of requirements which are necessary for inclusion of trainees into the program, furthermore each and every legislative demand on training as whole and lastly will provide practical and theoretical skills for conducting flight on multi-pilot aircraft or one-pilot airplane with multi-pilot operations.

Table 1: Theoretical training framework. Source: Authors.

Session	Contents	Learning time (h)
1.	Basics of CRM and MCC Accidents and incidents analysis considering CRM, MCC	10:00
2.	Multi-crew cooperation (analysis of specific SOP)	10:00
3.	Multi-crew cooperation (analysis of abnormal and emergency procedures)	5:00

Table 2: Practical training framework. Authors.

Session	Contents	Flight time (h)	Flights
MCC/1	Pre-flight preparation and briefing	2:00	12
MCC/2	Allocation of duties/roles	0:30	
MCC/3	Standard operational procedures		
	Taxiing	4:00	
	Departure briefing		
	Line up & take-off		
	After take-off and climb		
	Acceleration height	2:00	
	Cruise and cruise climb		
	Initial descent	2:00	
	Arrival & approach briefing		
	Final approach	2:30	
	Landing	2:30	
	Go-around		
	Abnormal & emergency procedures	3:30	
	Special procedures (TCAS, GWPS, incapacitation)	1:00	

4. Human element in MCC

The aim of whole MCC training is to teach future pilots how to cooperate and manage their resources accordingly whether it is time management or item management or anything else. This chapter is dedicated to explaining some basic principles of human interactions in cockpit. Firstly, SHELL model is proposed as a base for future explanation to help understand all interfaces which pilots are in cooperation with.

4.1. SHELL model

If we take a look inside this model, we can see that in centre there is one main attribute, the imperfect person (pilot). This component is the most critical one as humans tend to have variation in performance and certain limitations most of which are not easily predictable. In order to achieve optimal performance and cooperation with stress situations it is vital to set some characteristics which are of most importance for pilots to have.

- Physical shape and size;
- Personality and attitude;
- Input characteristics;
- Processing of information;
- Output characteristics;
- Environmental factors.

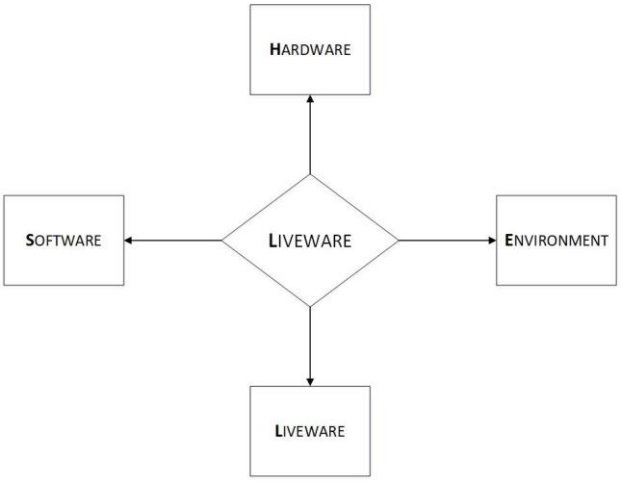

Figure 3: SHELL model. Source: Authors.

5. MCC training manual for L-410 aircraft

Standard operational procedures are the basis of cockpit working concepts. Standard operating procedures are the basis of cockpit working concepts. A defined task, e.g., flying an instrument approach to land, is always performed in the same manner with a defined course of actions. Of course, there are different procedures available to operate an aircraft on the same safety level but reducing the number of possible procedures to only one standard procedure has an enormous advantage: All crew members have the same mental model of the task to perform and any deviation from that mental model will be noticed immediately. SOP's are a form of anticipated communication and the basis for effective monitoring. Adhering to SOP's requires a high working discipline, any deviation from the pre-scribed course of action has to be announced before-hand. After discussion of the planned deviation and the conclusion that this deviation provides more efficiency and safety than adhering to the SOP, all crew members possess the same mental model again and the planned action may be performed. Within an airline SOP's are constructed on the same principles irrespective of the aircraft type, which has the advantage that after a transition to a new aircraft model, pilots do not have to change their working habits. [9]

Each operation and procedure regarding any of flight phases mentioned in this training manual is going to utilise optimal Crew Resource Management (CRM). While performing the training tasks the principle of continuous mutual briefings shall be practiced in coordination with mutual assistance between both pilots. During the MCC course all students will be encouraged to act as a commander in cockpit and therefore engage in open communication between their crew member e.g., another student flying in role as co-pilot.

Checklists and proper SOP are the main focus of this manual. Therefore their correct usage shall be encouraged all the time during normal operations training. While the L-410 can be flown from both sides of the cockpit, normally it is manoeuvred by one designed pilot. It can be eighter the commander of the aircraft or co-pilot designated by commander of the aircraft. This will depend on pre-flight briefing with both pilots and instructor. After this briefing the role of "pilot flying (PF)" and "pilot monitoring (PM)" is divided. The PF will actually manoeuvre the aircraft while the PM will cover all needed assistance work such as performance of checklists, aircraft configuration changes, ATC communication and other duties which could be allocated by PF. Such example could be during critical flight phases e.g., during take-off or landing when PM assists PF by monitoring all primary flight instruments and other necessary equipment which is crucial for proper continuation with training scenario. In table below there are the main duties regarding abovementioned positions in cockpit.

Table 3: Flight crew duties divided into roles. Source: Authors.

Pilot flying duties	**Pilot monitoring duties**
Controls the aircraft Navigates the aircraft Issues of commands to PM to perform setting of navigation equipment Issues of commands for change of configuration Issues of checklists performance from take-off to landing Monitors PM communication with ATC (in training simulation instructor acts as ATC) Checks correct navigation and communications frequency settings Performs briefing before landing If autopilot is available decides its use	With commands from PF controls engines (also according to simulated weather conditions) Communicates with ATC (in simulation with instructor) Performs navigation records of flight Sets up navigation equipment in accordance with PF commands Performs checklist in accordance with PF commands Monitors area in front of aircraft during flight checks (crash avoidance) Monitoring of weather conditions Notices PF to deviations in flight parameters (airspeed, altitude, bank angle…) During climbs and descends reports before reaching and after reaching cleared altitude or FL. Notices PF of any deviations during flight (take-off, en-route, approach, landing)

5.1. Debriefing after a flight session

When students are leaving simulator, eighter one or both pilots, instructor shall consult his/ her notes with them. During this debrief all instructor concerns should be addressed and clarified by students themselves. The main point of debriefing is to evaluate, guide and open discussion with students. It should be led accordingly:

- Firstly, start with constructive points of student's performance;
- Instructor shall identify errors and reasons why those errors took place in first-hand. Then find strategies for improvement and correction. Pinpoint maximum of three key areas to improve for better memorization;
- Approach technical and non-technical errors and clearly describe and explain them;
- Come to a conclusion but also encouragement for future motivation;
- Try to openly discuss issues with students.

At LVVC on L-410 flight simulator there is a possibility to watch a video recording (video playback) of session to show the student how the particular error has been made and how to successfully improve and overcome it. Other tools such as white board can be used to better explain the student how to improve his/her performance.

Student's progress or regress shall be assessed against the required optimal standards but also progress of other students shall be taken into account. [14] In table below, "dos and don'ts" of instructor's input are visible:

Table 4: Instructor's input in debrief guidelines. Soruce: [14].

DO	DO NOT
Provide facts Fair evaluation Provide constructive critique Encouragement of self-analysis Try to include all fails Listen careful Be empathic	Ask student to assess his/her performance Be vague Use aggression, sarcasm or be irritated Be apologetic Focus on minor items Exaggerate or personalise any issue Talk about items if you are unsure of Impose own or specific company SOP

6. Cockpit familiarization

In this chapter a cockpit layout is going to be divided into sections and its details are going to be explained. It serves the purpose of cockpit familiarization for students. During flight training dashboard can be divided into PF part and PM part. PF is mainly fixed on his/her PFD unit and only monitors navigation and engine parameters from time to time. That is the PM job.

He/she has to monitor his/her PFD unit and also navigational and engine parameters unit. That is PM main duty.

Figure 4: Dashboard layout. Author: Ing. Filip Škultéty, PhD

7. Conclusion

With this paper, the author tried to create a general MCC training manual for use on the L-410 simulator located in the LVVC premises. It can be stated that the aim of the work to create such a manual is met and its implementation can be considered sufficient by the author. According to the author, this paper can be used as a study material or an aid in multi-crew cooperation training.

The Paper itself is divided into two parts. In the theoretical part, the author tried to clarify the basic information about the subject of the paper, i.e., the L-410 aircraft simulator itself, to approach the basic legislative requirements for the simulator itself, but also for students who complete this training. He also outlined the current state of MCC training in LVVC and its history.

In the practical part of the paper, the author deals with the explanation of the human factor associated with the cooperation of a multi-member crew and its proper functioning during the flight. Also, especially, the author tried to create so-called SOP procedures stylized for a specific type of aircraft L-410 UVP E20, which are the main content of MCC training. While compiling them, he relied on the knowledge of pilots who flew in person on this type of aircraft, as well as on the expert advice of his supervisor and other experts in the field of MCC training.

Finally, the author adds that the work can also serve as an aid in type training, but not as its main syllabus. The author sees its use as a basic summary of knowledge that pilots of a multi-member crew should have to best perform their duties on this type of aircraft. However, the principles of the procedures described by the author could be applied to other types of aircraft as well.

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