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PROPOSAL OF PROCEDURES FOR BUSINESS AVIATION JETS OCEANIC FLIGHT PLANNING

DISSERTATION THESIS PRECIS

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INTRODUCTION

Flying over the oceans is nowadays quite usual for business aviation air carriers operating small aircraft. Business jets are today frequent visitors to diverse worldwide airspaces. From the perspective of flight preparation and flight planning these flights range between the most complicated ones. There is a gap in current approaches to operational control in business aviation and its personnel. The Operations Control Centres (OCCs) respond to a non-regular demand of business aviation and must perform without mistakes. Oceanic flights are complicated and create an additional workload on dispatchers.

In the business aviation community, not enough attention is paid to the importance of procedures setup leading to a safe operation. With a higher number of flight areas, which each has many specifics, a high degree of pre-flight research is necessary to get aware of the procedures and required prerequisites. One of the solutions is to focus on the position of Operations Control Centres (OCC) and their dynamic capacity planning setup.

1 CURRENT STATE IN THE FIELD OF DOCTORATE THESIS

The three of the described areas (OCC, Business Aviation and Oceanic Flying) form a very complex set of activities. The common feature of all of them is the dynamics of their development. Operation control is a crucial activity for safe operations. Unfortunately, with the different forms of aviation, understanding of its principles is variable. Substantial legal and unified regulation should be in place, but instead of a specific set of rules, somewhat abstract legal documents with recommendations are published.

This fact leads operators to setting up their standards in many different ways. The consequences then influence more areas than just safety. The OCCs may look for a guarantee of quality by licensing their personnel but in business aviation, most of them do not employ licensed dispatchers. The dispatchers of such operators face a lot of new challenges because of the character of business aviation. Personnel training requirements are insufficient on both levels, national and international. The regulators in most countries do not consider licensing obligatory. This again allows small flight departments to perform OCC task with inexperienced dispatchers who can easily make mistakes. This condition represents a high risk to the industry.

It is not an easy task to fully measure the quality of a dispatcher and there may be critical differences among various individuals performing in one team. The factors that contribute to a better readiness to react to repetitive and new situations are for example the dispatchers ‘personality, experience, time spent in the position or also age. The education, ability to multi-task and combine or perform in a team are also important. Typical dispatchers start their careers by following checklists and doing separate steps without the in-depth knowledge behind. With the growing on-hands experience the actions are based much more on knowledge. When oceanic flights appear on schedules, the dispatchers may face a significant gap in their knowledge. Operational control of oceanic operations bears several differences. It is one of the most complicated areas. It requires more profound knowledge and a high degree of self-coordination of the performing dispatcher.

The area to focus on to mitigate the possible effects of low or no knowledge is dimensioning. It is important that the OCC has an adequate capacity to reply to the entire set of requests. The time periods of high and low workload may be frequent and to adequately dimension the department is complicated. If the OCC is under-dimensioned, the dispatchers face overload and commit errors or they do not finish their jobs satisfactorily and on time. In the opposite case, the dispatchers may have periods without any activity and that is when they lose the ability to be re-activated and consequently they may commit errors as well. For operators with a known schedule, it is easier to calculate the adequate OCC size to satisfy the operation demand. The task is much more complicated for irregular traffic because the flights are created randomly and often without a predictable pattern. To summarise the scientific knowledge state, the following statements are made:

a) business Aviation is a dynamic field and has a lot of unique specifics,
b) very little publicity is given to the topic of OCCs,
c) OCC is a vital element in the successive chain of flight operations activities,
d) dedicated personnel is needed to perform operational shifts,
e) lack of guidance and training material is evident,
f) a new set of skills is expected to take place in future training,
g) dynamic capacity planning is very scarce today,
h) regional differences exist, mainly between the United States and Europe,
i) a higher ratio of business aviation incidents/accidents are noticed recently,
j) oceanic areas are not satisfactorily described (guidance available only for NAT-HLA).

2 GOAL OF THE DISSERTATION THESIS

The main goal of the thesis is creating a methodology for OCCs capacity management in the field of business aviation. This methodology focuses on areas which are typical for this kind of operations and helps business aviation operators to structure their OCCs´ size dimensioning. It results in better responding to the complex flights request such as oceanic crossings. A lower number of errors will be made, and a better time slot will be obtained even for more complicated tasks.

A partial goal of the thesis is to propose a set of functions describing flights complexity and dispatchers' quality and composition. Assessment of different days with a different load of flights and composition of dispatchers is created.

Another partial goal of the thesis is creating an algorithm. The algorithm is built to provide a tool to managers to perform OCC shift planning based on dynamic calculation. The intention is to provide periodical recalculation of available functions prior to each day and manage the shift composition dynamically. A simple analysis of possible savings thanks to the dynamic planning approach is performed at the end of the methodology application.

3 RESEARCH METHODS

The author applied several quantitative methods for the assessment part and qualitative methods for the proposal part. At the first stage, a research made in real life conditions of an OCC was performed. Personal on-hands experience in the field was a great source of knowledge. To complement the personal experience, articles and books from the field have been read and reviewed. This set of assets has helped to get a more specific idea on how to build the research methodology. Statistics methods, especially regression analysis, were then applied. The following research techniques and methods are used in the dissertation:

a) recording personal knowledge,
b) literature review,
c) brainstorming and discussion with experienced leaders in the field,
d) consultations with performing professionals,
e) observation and recording of real-life situations,
f) regression analysis (multiple linear regression).

A proposal of adequate and simplified mathematical functions and variables linked to flights and OCC specifics helped create the algorithm. The following variables were described mathematically:

a) departure and arrival airports,
b) the geographical area of departure and arrival airports,
c) services complexity,
d) date and time of departure,
e) time of flight notification,
f) knowledge of flight,
g) dispatch time,
h) flight readiness,
i) number of flight changes,
j) flight preparation duration.

To validate the proposed algorithm, a set of real operations data was analysed. It was an extract from a small operator having a simple one-aeroplane fleet. The aim of this sampling was to understand typical behaviour, to cover seasonal and to help identify inconsistencies. In the economic analysis performed at the end of the thesis financial effects of each of the approaches described in the algorithm were compared.

4 PROPOSED METHODOLOGY

The author solved the problem in two parts. One deals with the algorithm creation, whereas the other one with its application.

A. Algorithm creation

Identification of functions describing flights and analysing their behaviour

Based on a combination of known current data and historical data, it is estimated what effect future flights, and their combination will have on the OCC. Some of the parameters and variables are quite evident and can easily be identified immediately when a flight is created. Unfortunately, other parameters are hardly predictable and can only be measured precisely during flight preparation or, in the worst case, only after the flight is executed. The author proposed the following set of flight-related functions and indexes to describe flights. With them he proposed the Flight Complexity Function.

- The Familiarity of the Departure Airport

$$F_{da} = \frac{\sum_{i=d-1}^{d-366} n_{di}}{\sum_{i=d-1}^{d-366} ni} \; [-] \qquad (4\text{-}1)$$

- The Familiarity of the Arrival airport

$$F_{aa} = \frac{\sum_{i=d-1}^{d-366} n_{ai}}{\sum_{i=d-1}^{d-366} ni} \; [-] \qquad (4\text{-}2)$$

- The Familiarity of City Pair

$$F_{cp} = \frac{\sum_{i=d-1}^{d-366} n_{adi}}{\sum_{i=d-1}^{d-366} ni} \; [-] \qquad (4\text{-}3)$$

- Geographical Area Index

$$I_{ga} = I_{gad} + I_{gaa} \; [-] \qquad (4\text{-}4)$$

- Number of Flight Changes

$$I_{nch} = \frac{N_{ch}}{N_{chMax}} \; [-] \qquad (4\text{-}5)$$

- Knowledge of Flight Index

$$I_{kn} = 1 - \frac{T_{kn}}{T_{kn}+2} \; [-] \qquad (4\text{-}6)$$

Flight Complexity Function proposal and simplification

The flight complexity is affected by geographical, political, meteorological, organisational and technical factors. These factors together influence how complicated a flight is. It needs to be assessed which of them are predominant and which are not important and can be omitted from the calculation. The Flight Complexity Function is obtained by applying the correlation and regression analysis in Microsoft Excel. It is then simplified in several steps by using Enter and Stepwise method of Multiple Linear Regression (MLR) to provide an efficient and simple formula (4-7) to assess each flight.

- Flight Complexity Function

$$I_{flc} = 3.15 + 0.8 \cdot I_{ga} - 4.12 \cdot I_{kn} \; [-] \qquad (4\text{-}7)$$

After the MLR applied, it can be stated that the flight complexity is an 83% function of the geographical area index and knowledge of flight index. This fact is very useful because both parameters are very easy to obtain and they do not change in time.

Identification of OCC qualitative functions

To be able to see how well a shift is covered by adequate composition and number of dispatchers, several indexes are introduced. The goal is to compare them and find misbalances between them for each day. The simple methods used today bring unnecessary over-dimensioning of OCC responding to maximum possible volumes or under-dimensioning respecting average volumes. Both approaches bring disadvantages such as low-utilisation resulting in higher risk to commit errors or inadequately high cost of dispatchers when the operation volumes are low. The author proposes the following set of OCC-related functions:

- OCC Shift Quality Index I_{sq}

$$I_{sq} = \frac{\sum_{i=1}^{N} I_{qali}}{N} \; [-] \tag{4-8}$$

- OCC Day Quality Index I_{dq}

$$I_{dq} = \frac{\sum_{i=1}^{S} I_{sqi}}{S} = \frac{\sum_{i=1}^{S} \frac{\sum_{j=1}^{N} I_{qalj}}{N}}{S} \; [-] \tag{4-9}$$

Introduction of Demand Indexes D_{sft} and D_{day}

Both indexes represent a combination of the number of supported flights and Index I_{flc} describing their complexity. D_{day} is calculated as the sum of flight complexities on the day of shift and flight complexities on the following day as per the proposed formula.

$$D_{sft} = \frac{\sum_{1}^{N_d} I_{flc}(d) + \sum_{1}^{N_{d+1}} I_{flc}(d+1)}{S} \; [-] \tag{4-10}$$

$$D_{day} = \sum_{1}^{N_d} I_{flc}(d) + \sum_{1}^{N_{d+1}} I_{flc}(d+1) \; [-] \tag{4-11}$$

Introduction of Capacity Indexes C_{sft} and C_{day}

The counterpart to the demand indexes is the capacity of OCC to dedicate their time to the given demand of flights. Two indicators are introduced: Shift Capacity C_{sft} and Day

Capacity C_{day}. OCC Shift Quality Index I_{sq} is a crucial contributor to both indexes. C_{day} is composed of all C_{sft} included in one day. This is typically two or three shifts according to the chosen scheme. The shift capacity is calculated as per the formula (4-12).

$$C_{sft} = C_{dis} \cdot I_{sq} \cdot N\ [-] \qquad (4\text{-}12)$$

The definition of Day Capacity C_{day} is very simple. It considers the C_{sft} and multiplies it by the number of shifts.

$$C_{day} = (C_{dis} \cdot \sum_{i=1}^{S} Ni) \cdot I_{dq}\ [-] \qquad (4\text{-}13)$$

Definition of Dispatcher Comfort Index C_{dis}

It is essential to define the number of flights that a single business aviation dispatcher handles per shift without compromising quality. This information is called a dispatcher comfort constant C_{dis}. It is crucial to set up the C_{dis} to match the given operations. It may be done by guessing and consequent adjustments or by estimating based on on-hand experience. The proposed way is to apply the set of data retrospectively on a known period of operation (for example one year) to define overexposure, underexposure and effective exposure.

Definition of boundary conditions

The basic non-equation is $C_{day} \geq D_{day}$. The chosen value of C_{dis} represents a boundary between comfort and discomfort. A quick analysis based on the author´s experience has been performed to assess the below situations. C_{dis} was set up by default to 15 resulting in $C_{day} = (15 \cdot \sum_{1}^{S} N) \cdot I_{dq}$. The possible situations are listed below.

a) overexposed days - candidates to swap or decrease the number of dispatchers,
  - $C_{day} < D_{day}$
  - $\frac{D_{day}}{C_{day}} > 1$

b) effectively exposed days - a default number of dispatchers per shift will be kept,
  - $C_{day} \geq D_{day}$
  - $0.2 < \frac{D_{day}}{C_{day}} < 1$

c) underexposed days - candidates to decrease the number of dispatchers.
  - $C_{day} \geq D_{day}$
  - $\frac{D_{day}}{C_{day}} < 0.2$

B. Algorithm Application

Obtaining of D_{day} for each required day

Based on the below-listed formulas the algorithm starts by looking into the appropriate FOS system with logged information for the available values to build the I_{flc} of each flight and then build D_{day}. The full process before simplification of I_{flc} is described in Figure 1.

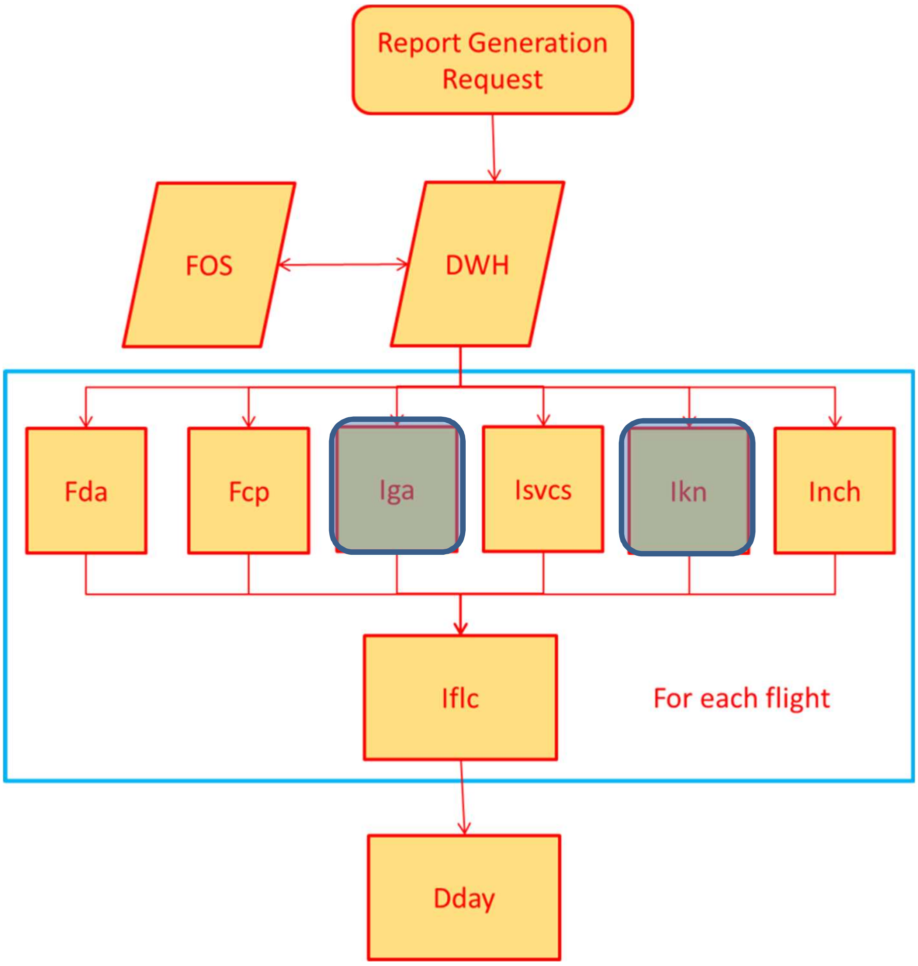

Figure 1 Diagram describing day demand index obtaining

Source: Author

Obtaining of C_{day} for each required day

Based on the formulas the algorithm looks into the appropriate TNA system for the available values to build the C_{day}. The process is described graphically in Figure 2.

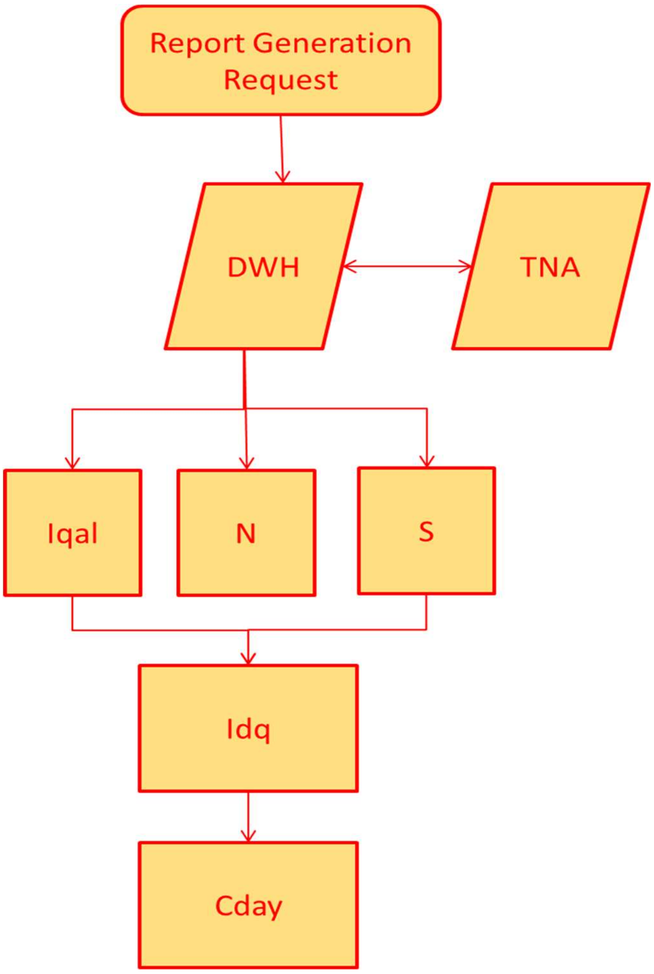

Figure 2 Diagram describing day capacity index obtaining

Source: Author

The proposed format of the information about expected $\mathrm{D_{day}}$ and $\mathrm{C_{day}}$ is an automatically generated report which includes evidence about the number of flights $\mathrm{N_d}$ and $\mathrm{N_{d+1}}$, their cumulative flight complexity $\mathrm{I_{flc}}$ and OCC shift quality index $\mathrm{I_{sq}}$.

Report Generation

The source data of the report is DWH linked to FOS and TNA. The two initiators for the report to be generated are assignment (or re-assignment) of dispatchers to shifts and creation (or changes/cancellation) of flights. Logically, for closer dates, the information about flights will be quite complete, whereas further dates flights might not have been created yet. For this reason, it is advisable to set up a deadline to deal with capacity planning that is close to the day of report generation and at the same time will not cause unpleasant late notices for dispatchers. The flow is shown in Figure 3.

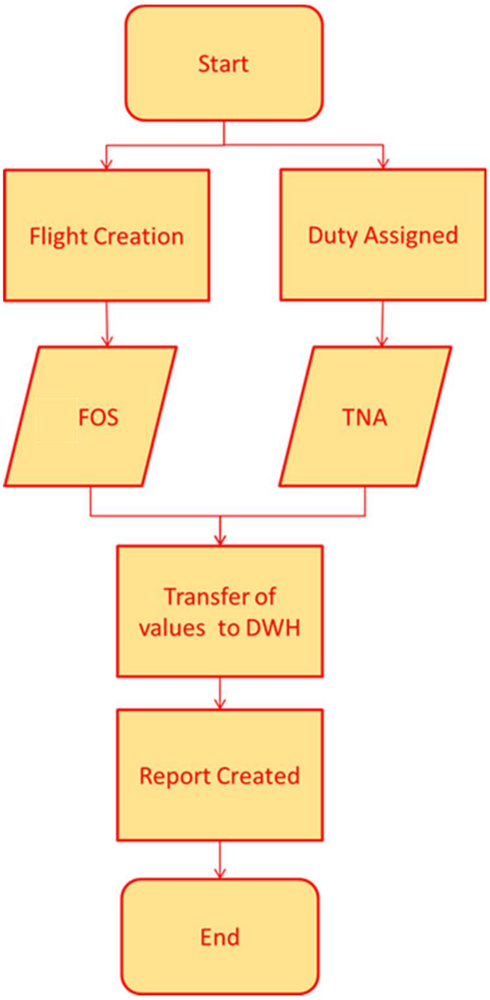

Figure 3 Report creation process logic

Source: Author

Capacity Planning Application

The proposed algorithm monitors each operations day from day + 1 until day + 30 and looks for candidates where the number of dispatchers could be changed. The closer it gets to the date of operations, the more precise the information contained in the results is. There are several limiting conditions. The number of dispatchers on shift must have a minimum value. In a situation where zero flights are programmed, more than zero dispatchers must be on shift. The decision whether to call for additional dispatchers or leave some of the previously planned unused must be made in an acceptable time frame. Based on the expected $\mathrm{D}_{\mathrm{day}}$ and default planned I_{dq} a decision is to be made on how many dispatchers are needed for reductions or increases. This is be obtained by calculating $\frac{\mathrm{D}_{\mathrm{day}}}{\mathrm{C}_{\mathrm{day}}}$. The last part of the process for cases where $\frac{\mathrm{D}_{\mathrm{day}}}{\mathrm{C}_{\mathrm{day}}} > 1$ has the below-described phases.

- **Swapping dispatchers**

C_{day}will have to be increased to lower the whole fraction to at least one. To reach so the increase will have to be equal to $D_{day} - C_{day}$. This can be done by increasing I_{qal}which in practice means replacing dispatchers of lower performance with their better colleagues.

- **Adding dispatchers**

A more appropriate method is adding dispatchers to shifts (increasing N). By increasing the number of dispatchers I_{dq}will be changed too. Paradoxically, increasing N can sometimes decrease I_{dq} (by using additional dispatchers with very low I_{qal}). To get an answer to the initial questions about numbers, the formula (4-14) is applied.

$$\Delta C_{day} = C_{dis} \cdot \sum_{1}^{S}(N + \Delta N)\,(I_{dq})\ [-] \tag{4-14}$$

To be able to solve this equation, ΔN is put equal to one, two…x (number of dispatchers) and $\Delta I_{dq}$is calculated according to formula (4-15).

$$I_{dq} = \frac{D_{day} - C_{day}}{C_{dis} \cdot \sum_{1}^{S}(N + \Delta N)}\ [-] \tag{4-15}$$

For $\Delta N = 1$ a corresponding value of ΔI_{dq} is calculated. If the available dispatcher meets the quality criteria, the overexposure problem is resolved. If not, the process continues with setting up ΔN equal to two. The same is recalculated again to obtain a new value of I_{dq}.

- **Decreasing number of dispatchers**

The steps for cases where $\frac{D_{day}}{C_{day}} < 0.2$ (underexposure) will be similar. The formula (4-16) is then applied. The equation is recalculated for minus one dispatcher on shift.

$$\Delta C_{day} = C_{dis} \cdot \sum_{1}^{S}(N + \Delta N) \cdot (I_{dq}) - \frac{D_{day}}{0.2}\ [-] \tag{4-16}$$

The decision to decrease the number of dispatchers may be risky if flights are created at late notice unexpectedly and the decreased composition of dispatchers suddenly becomes overexposed. Another risk might occur for days without overexposure with C_{day} and D_{day}

very close to each. When additional flights are created at late notice, the manager does not have sufficient time to react. Some operators may choose the critical $\frac{\mathrm{D_{day}}}{\mathrm{C_{day}}}$ slightly lower than one to avoid such situations. A flowchart of the whole algorithm is provided in Figure 4.

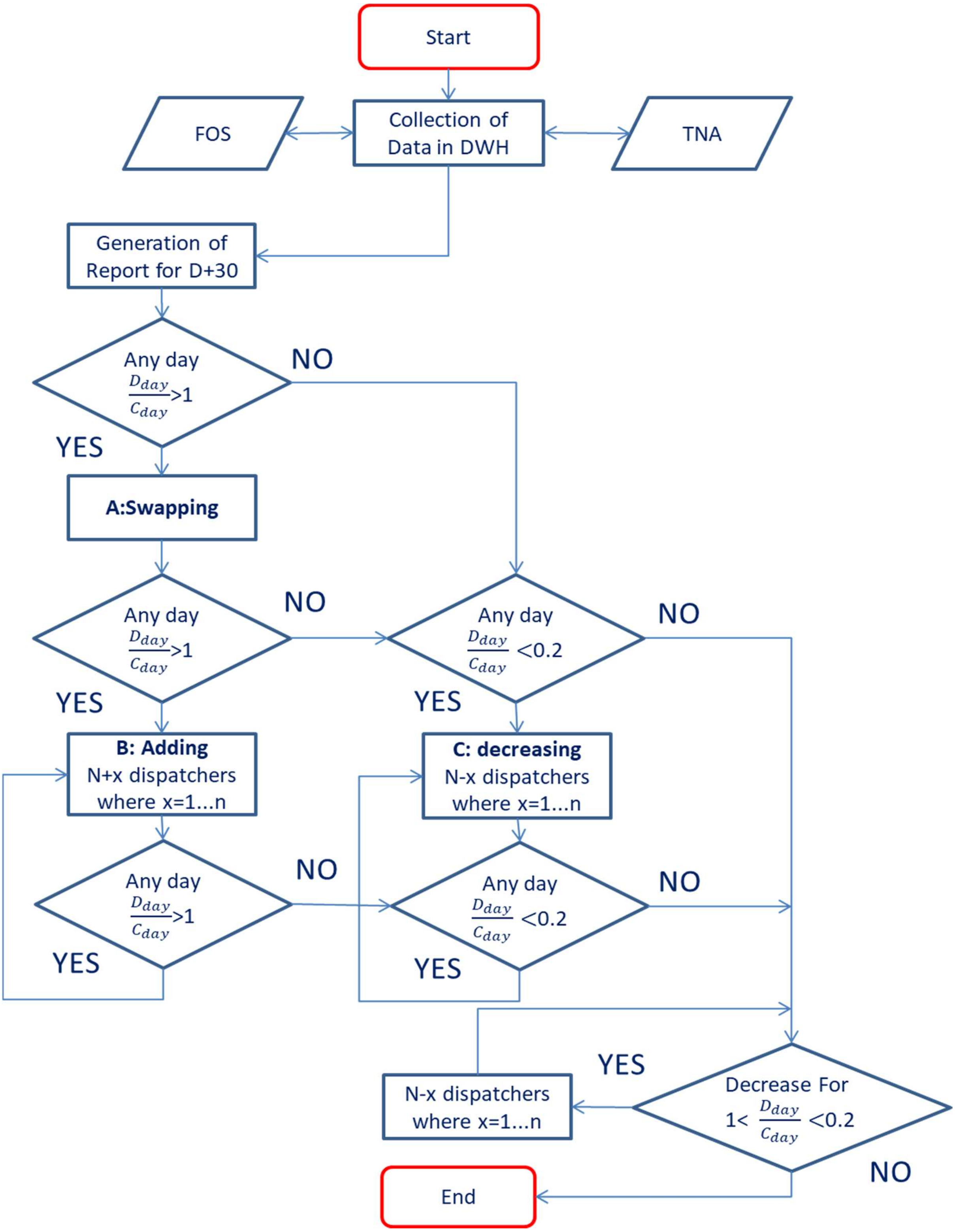

Figure 4 Algorithm Flow Chart

Source: Author

5 CASE STUDY

The case study is performed to confirm the functionality of the algorithm and the whole methodology. This case study also serves as a source of data for the simple financial analysis. A randomly selected operational data from 30 consecutive days were used. The data, with their corresponding initial values, describe the below situation.

- the OCC is composed of ten dispatchers with the different values of I_{qal} ranging from 0.5 to 0.95,
- two shifts pattern is used at the OCC,
- two dispatchers work on each shift,
- the data were taken retrospectively to avoid changes in their values.

After the period of 30 consecutive days was analysed, a total of six cases of overexposure and two cases of underexposure were found. For the remaining 22 days, the shift composition was adequate to the demand. The total number of dispatchers initially needed to cover all shifts was 120 with 12 shifts served by each dispatcher on average. The critical shifts are shown in Table 1.

Table 1 Overview of days to be dynamically adjusted

Date	Number of dispatchers per shift (N1)	Number of dispatchers per shift (N2)	Number of Flights (Nd)	Total Iflc	Dday	Idq	Cday	Dday/Cday
Day 2	2	2	28	22.4	48.5	0.52	31.2	1.55
Day 3	2	2	29	26.1	52.5	0.71	42.6	1.23
Day 4	2	2	33	26.4	47.1	0.62	37.2	1.27
Day 7	2	2	27	24.3	54.9	0.75	45.0	1.22
Day 8	2	2	34	30.6	53.7	0.63	37.8	1.42
Day 9	2	2	33	23.1	39.2	0.57	34.2	1.15
Day 24	2	2	7	4.9	8.9	0.79	47.4	0.19
Day 30	2	2	5	4.0	4.0	0.89	53.4	0.07

Source: Author

At first instance, the situation with an unchanged number of dispatchers is observed. This means covering problematic shifts with higher I_{dq}. Swapping dispatchers may be an option for shifts with a slight overexposure but will be very difficult to apply for more overexposed days. The results of the swapping phase are shown in Table 2.

Table 2 Overview of the solution with planning better dispatchers

Date	Number of dispatchers per shift (N1)	Number of dispatchers per shift (N2)	Number of Flights (Nd)	Total Iflc	Dday	Idq New	Cday New	Dday/Cday
Day 2	2	2	28	22.4	48.5	0.81	48.5	1.00
Day 3	2	2	29	26.1	52.5	0.88	52.5	1.00
Day 4	2	2	33	26.4	47.1	0.79	47.1	1.00
Day 7	2	2	27	24.3	54.9	0.92	54.9	1.00
Day 8	2	2	34	30.6	53.7	0.90	53.7	1.00
Day 9	2	2	33	23.1	39.2	0.65	39.2	1.00
Day 24	2	2	7	4.9	8.9	0.79	47.4	0.19
Day 30	2	2	5	4.0	4.0	0.89	53.4	0.07

Source: Author

A more realistic option is adding dispatchers to the problematic days and calculate the necessary I_{dq} to minimise the exposure. Effects of the situation with one additional dispatcher to each critical day are shown in Table 3. It confirms that adding one dispatcher will solve the problem of three days.

Table 3 Overview of the solution with additional dispatchers

Date	Number of dispatchers per shift (N1)	Number of dispatchers per shift (N2)	Number of Flights (Nd)	Total Iflc	Dday	Idq New	Cday New	Dday/Cday
Day 2	2	3	28	22.4	48.5	0.65	39.0	1.24
Day 3	2	3	29	26.1	52.5	0.70	53.5	0.99
Day 4	2	3	33	26.4	47.1	0.63	46.5	1.01
Day 7	2	3	27	24.3	54.9	0.73	56.25	0.98
Day 8	2	3	34	30.6	53.7	0.72	47.25	1.14
Day 9	2	3	33	23.1	39.2	0.52	47.75	0.92
Day 24	2	2	7	4.9	8.9	0.79	47.4	0.19
Day 30	2	2	5	4.0	4.0	0.89	53.4	0.07

Source: Author

The remaining three problematic days will be resolved by the same steps, but two added dispatchers will be needed here. The final number of dispatchers on shifts after the dynamic planning applied is shown in Table 4.

Table 4 Final number of dispatchers after dynamic adjustments

Date	Number of dispatchers per shift (N1)	Number of dispatchers per shift (N2)
Day 2	3	3
Day 3	2	3
Day 4	3	3
Day 7	2	3
Day 8	3	3
Day 9	2	3
Day 24	1	1
Day 30	1	1

Source: Author

To shape the shifts composition very tightly, the last step that can be done is to look at days where effective exposure is obtained and look whether the number of dispatchers on shifts could be decreased without exceeding $\frac{\mathrm{D_{day}}}{\mathrm{C_{day}}} = 1$. Having applied this approach a total of 18 dispatchers can be saved. The number of dispatchers after the dynamic planning steps corresponds to the below numbers:

- shifts without dynamic planning: 120 shifts to be covered,
- shifts with an increased number of dispatchers: 129 shifts to be covered,
- shifts with increased and decreased number of dispatchers:125 shifts to be covered,
- shifts with increased and decreased number of dispatchers: 107 shifts to be covered.

The results of the previous case study were used as a source of data for the defined financial impact of the scenarios. For the first option with the same composition of dispatchers where obtaining higher $\mathrm{I_{dq}}$ is managed only by increasing $\mathrm{I_{qal}}$, no differences in financial demand will be achieved. For the other three scenarios, the financial demand will be different. For the first two, a slight increase in cost (about one per cent) will be seen. With the last one saving of about slightly below ten per cent will be manageable. The proposed method tackling the issue is to replace the all increased and decreased shift numbers by standby dispatchers who can be activated until shortly before the shift. Standby dispatchers are typically cheaper than those assigned fixed shifts.

6 RESULTS

The complex set of activities related to the dynamic concepts of operational control, business aviation and oceanic planning were described from several viewpoints. At the first stage, it was the dispatchers′ views and examples of what the practice shows. Typical activities, tools, software and limitations were introduced.

The primarily recognised hazard was the capacity management of OCCs. The author looked for answers in the legal part. He described documents provided on the Czech, European and worldwide level. It was discovered and reconfirmed that OCC activities affect the safety significantly and should be backed by a robust system and requirements.

With the operators looking for a safety-enhancing solution in mind to manage their operational control, the author proposed a methodology. The first idea was to mine historical data so they could help evaluate similar situations taking place in the future. This would not be possible without expecting the operators have several necessary tools in place (FOS, TNA, DWH). An analysis of the business was done to reconfirm the assumptions. The validated and corrected results helped create the methodology.

In the next step available historical flight data were analysed, and information obtained from them was classified. This helped create functions and indexes to provide numerical results. Some of the functions and indexes are based on the author′s experience. This is the case of the Geographical area index $\mathrm{I_{ga}}$or Services complexity index $\mathrm{I_{svc}}$. This set of functions provided a definition of what information could be either measured or calculated in advance to provide a numerical evaluation of each flight. This was named Flight complexity function $\mathrm{I_{flc}}$. The MLR helped to simplify the $\mathrm{I_{flc}}$ and create a simple function with predictable variables.

After having obtained the flights data, it was crucial to set up their counterpart in OCC shifts and dispatchers. In a very similar way, a set of functions was sought to describe how individual quality of dispatchers affect their performance. The Dispatcher Comfort Index $\mathrm{C_{dis}}$ was introduced and provided the necessary border between comfort and discomfort.

A day was decided to be a better representation of time rather than shifts because all necessary changes in the number of dispatchers on different shifts of the same day could be obtained more easily.

With flights and OCC-related indexes already defined, demand and capacity indexes were described and a definition of their specific ratio leading to overexposure (in this case $\frac{D_{day}}{C_{day}} > 1$), underexposure (in this case $\frac{D_{day}}{C_{day}} < 0.2$) and effective exposure setup.

The resulting algorithm suggests a periodically generated report containing flights 30 days in advance. The report helps managers of OCCs take strategic decisions. The algorithm increases accuracy with the growing number of available historical flight data. The results may easily be used for different operations by simply adjusting the entry parameters. For beginning operations with lack of operational data all of the indexes can be replaced by constant average values and provide more straightforward outputs with a reasonable degree of accuracy.

The described source inputs from FOS and TNA is required. The resulting tool has the ambition to be a supportive functioning universal tool helping OCCs to manage their capacity in a better way.

It was initially also meant to bring significant financial savings, but the results showed later that the amount of money saved is negligible. The results of the case study were used as a source of data for the defined financial impact of the scenarios. For the first option with the same composition of dispatchers where obtaining higher I_{dq} is managed only by increasing I_{qal}, no differences in financial demand were achieved. For the other three scenarios, the financial demands were different but none of them guaranteed dramatic savings.

To decrease dispatchers on low volumes shifts is financially interesting but it bears the risk of last minute flights creation. The proposed way tackling the issue is to replace all decreased shift numbers by standby dispatchers who can be activated shortly before the shift. Standby dispatchers are typically cheaper than those with assigned fixed shifts.

7 ACHIEVEMENTS OF THE DISSERTATION THESIS

The main contribution of the dissertation thesis is seen in the following areas:

- Profound description of flight preparation processes,
- proposal of flight and OCC related functions,
- design of methodology helping operators streamline their OCCs,
- preliminary design of the operational report,
- development of algorithm leading to better shifts coverage,
- increasing safety.

The future consideration for the topic to be developed would be focusing on demand and capacity of each individual shift instead of days and look for seasonality specifics. Another enhancement would be combining the aspects of capacity planning with training to the degree where I_{qal} of individual dispatchers will be manageable and predictable in time. To fully confirm the hypothesis, partial and entire results of the thesis and live application of the methodology in a real OCC will be necessary.

CONCLUSION

The author focused on a topic very rarely touched by information sources. The steps and the direction taken in the dissertation thesis were heavily based on the author's experience combined with interest and general information available about the industry.

The area of business aviation has a tremendous contribution to the relative random character of operations. Operational control represented by OCCs has many specifics linked to human ability and capacity to respond to the created demand. Oceanic flights were supposed to be the primary focus, but during the analytical part, it was found out that the problem of capacity planning and training is spread out on the entire level. The training requirements for dispatchers in Europe today are benevolent, the responsibility is left to the operators, and the applicable syllabuses are old-fashioned. For this reason, the author decided to turn his attention to the area of capacity planning fully and proposed a global tool based on analysing all the flights (out of which oceanic flights undoubtedly represent one of the most complicated operations).

The goals defined in the thesis to set up a methodology for OCCs capacity management and to provide a tool for business aviation operators to help them structure their OCCs´ size dimensioning while increasing safety have been fulfilled.

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ABSTRACT

The thesis is dedicated to the problematic of operations control centres in the business aviation field. Emphasize is given to flights over the oceans and capacity management of the department. In the first part of the thesis, an analysis of the current state is made. Areas with a potential for improvement are defined. In the following part, procedures for capacity planning optimisation are proposed.