CZECH TECHNICAL UNIVERSITY IN PRAGUE

Faculty of transportation sciences

Department of Air transportation

Analysis of EDTO (Extended Diversion Time Operations) Diversion Locations

Master's thesis

Study program: Technology in Transportation and Telecommunications

Field: Air Traffic Control and Management

Supervisors: Ing. Peter Olexa

doc. Ing. Jakub Hospodka, PhD.

Bc. Štěpán Moninec

Praha 2022

CZECH TECHNICAL UNIVERSITY IN PRAGUE
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K621 ..... **Department of Air Transport**

MASTER'S THESIS ASSIGNMENT

(PROJECT, WORK OF ART)

Student's name and surname (including degrees):

Bc. Štěpán Moninec

Study programme (field/specialization) of the student:

master's degree – PL – Air Traffic Control and Management

Theme title (in Czech): **Analýza vzdálených diverzních lokací pro provoz EDTO**

Theme title (in English): **Analysis of EDTO (Extended Diversion Time Operations) Diversion Locations**

Guidelines for elaboration

During the elaboration of the master's thesis follow the outline below:

- Aim of thesis is analyze and summarize legislation requirements and requirements for flight planning of diversion airports in EDTO and create an operational handbook for these airports.
- Summarize legislation requirements for planning and selecting diversion airports in ETOPS.
- Identification of general requirements based on legislation and requirements of operators.
- Current availability of data about diversion location planned in EDTO.
- Analysis of selected airports based on general requirements.
- Creation and validation of operational handbook for flight planning.

Graphical work range: according to the instructions of thesis supervisor

Accompanying report length: minimum of 55 text pages (including figures, graphs and sheets which are part of the main text)

Bibliography:

ICAO Doc 10085 - Extended Diversion Time Operations (EDTO) Manual

YU Gang, QI Xiangtong. Disruption Management. Singapore. World Scientific Publishing Co Pte Ltd, 2004

ICAO Doc 9976 "Flight Planning and Fuel Management Manual"

Master's thesis supervisor: **Ing. Peter Olexa**

doc. Ing. Jakub Hospodka, Ph.D.

Date of master's thesis assignment: **August 27, 2021**
(date of the first assignment of this work, that has be minimum of 10 months before the deadline of the theses submission based on the standard duration of the study)

Date of master's thesis submission: **November 30, 2022**
a) date of first anticipated submission of the thesis based on the standard study duration and the recommended study time schedule
b) in case of postponing the submission of the thesis, next submission date results from the recommended time schedule

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I confirm assumption of master's thesis assignment.

Bc. Štěpán Moninec
Student's name and signature

Prague ..... May 17, 2022

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(PROJEKTU, UMĚLECKÉHO DÍLA, UMĚLECKÉHO VÝKONU)

Jméno a příjmení studenta (včetně titulů):

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navazující magisterský – PL – Provoz a řízení letecké dopravy

Název tématu (česky): **Analýza vzdálených diverzních lokací pro provoz EDTO**

Název tématu (anglicky): Analysis of EDTO (Extended Diversion Time Operations) Diversion Locations

Zásady pro vypracování

Při zpracování diplomové práce se řiďte následujícími pokyny:

- Cílem práce je analyzovat a sumarizovat legislativní požadavky a provozní potřeby leteckých provozovatelů pro plánovaní náhradních letišť v provoze EDTO a vytvoření provozní příručky pro tyto letiště.
- Shrnutí legislativních podmínek pro plánování letů a výběr náhradních letišť pro provoz ETOPS.
- Identifikace obecných požadavků na základě legislativních podmínek a požadavků operátorů.
- Současný stav dostupných informací o letištích pro plánování EDTO.
- Analýza vybraných letišť na základě obecných požadavků.
- Vytvoření a validace příručky pro plánování letů.

ČVUT FD

Rozsah grafických prací: dle pokynů vedoucího diplomové práce

Rozsah průvodní zprávy: minimálně 55 stran textu (včetně obrázků, grafů a tabulek, které jsou součástí průvodní zprávy)

Seznam odborné literatury:
ICAO Doc 10085 - Extended Diversion Time Operations (EDTO) Manual
YU Gang, QI Xiangtong. Disruption Management. Singapore. World Scientific Publishing Co Pte Ltd, 2004
ICAO Doc 9976 "Flight Planning and Fuel Management Manual"

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Datum zadání diplomové práce: **27. srpna 2021**
(datum prvního zadání této práce, které musí být nejpozději 10 měsíců před datem prvního předpokládaného odevzdání této práce vyplývajícího ze standardní doby studia)

Datum odevzdání diplomové práce: **30. listopadu 2022**
a) datum prvního předpokládaného odevzdání práce vyplývající ze standardní doby studia a z doporučeného časového plánu studia
b) v případě odkladu odevzdání práce následující datum odevzdání práce vyplývající z doporučeného časového plánu studia

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Abstract

Planning an alternate diversion location requires not only assuring the flight operations and safety requirements but also business and flight operational continuity. The main goal of this thesis is to analyze the problematics of the EDTO diversion locations planning, to analyze the global diversion locations that are most problematic, and to list the legislative and practical operational requirements. The most significant practical benefit of this thesis is a summary of data items that are required for flight planning of ETOPS flights in extended locations and are desired by legislative and airline dispatchers needs. These data items have been validated during guided interviews with five airline dispatchers, who are planning and overseeing ETOPS flights and showed the present state of information about these locations.

Keywords: extended diversion locations, legislative and operational requirements, an operational handbook, ETOPS flight planning

Abstrakt

Plánování vzdálených diverzních lokalit v provozu ETOPS znamená především zajistit bezpečný let dle legislativních požadavků, ale také vyhovět požadavkům leteckých dopravců pro plynulý provoz letadla z hlediska pozemního odbavení. Cílem této práce je identifikovat a sumarizovat legislativní požadavky a provozní potřeby leteckých provozovatelů pro plánování náhradních letišť v provoze EDTO a vytvoření provozní příručky pro tyto letiště. Hlavním přínosem této práce jsou data identifikována pomocí řízených rozhovorů s dispečery dle jejich skutečných potřeb pro plánování ETOPS letů. Těmito rozhovor byla potvrzena i současná situace ohledně dostupnosti informací o letištích v těchto vzdálených lokalitách.

Klíčová slova: vzdálené diverzní lokace, legislativní a provozní požadavky, provozní příručka, plánování ETOPS

Acknowledgments

Hereby I want to thank all people who helped me with this thesis and were supporting me during my studies. I would especially like to thank my supervisors, Mr. Ing. Peter Olexa and Mr. doc. Ing. Jakub Hospodka, PhD., for their professional guidance and valuable comments. I want to thank the dispatchers, who were involved in the research and were patient during the interviews.

Last but not least, I want to thank for psychical support to my friends and family, who supported me all the time.

Declaration

I hereby submit for assessment and defense a bachelor's thesis, prepared at the end of my studies at the Czech Technical University in Prague, the Faculty of Transportation Sciences.

I do not have a compelling reason against the use of this schoolwork within the intention of s. 60 of the Act No. 121/2000 Coll., on Copyright and Rights Related to Copyright and on Amendment to Certain Acts (Copyright Act).

I declare that I have elaborated this thesis independently using information sources listed in the bibliography in accordance with ethical guidelines for writing a diploma thesis which is listed in the document Methodological Instruction No. 1/2009.

In Prague on 30.11.2022

signature

Table of Contents

List of Figures

List of Attachments

Attachment 1: ETOPS Alternate Aerodromes_OH

List of abbreviations

AI	aeronautical information
AIC	Aeronautical Information Circular
AIP	aeronautical information publication
APU	auxiliary power unit
AIRAC	Aeronautical Information Regulation and Control
AIS	aeronautical information service
CAT	category
CCAR	Certification of Civil Aviation Products and Parts
CFR	Code of Federal Regulation
EASA	European Aviation Safety Agency
EDTO	Extended diversion time operations
ETOPS	Extended twin-engine operations
FAA	Federal Aviation Administration
FSS	flight station service
GPU	ground power unit
GSE	ground support equipment
ICAO	International Civil Aviation Organization
MEL	minimum equipment list
NOTAM	Notice to air mission
PIB	pre-flight information bulletin
POC	person/s of concern
RFFS	rescue and firefighting service
SARPS	Standards and Recommended practices
ULD	unit load device

Introduction

The abrupt failure of a major aircraft system or a sudden unexpected situation during the flight can force aircraft to divert from its planned flight path. In such a situation the aircraft needs to land safely and be accommodated in the nearest available en-route alternate aerodrome.

Until the 70s of last century, two-engine aircraft could fly on the route which at any point of its patch didn't exceed the rule of 60 minutes. The rule of 60 minutes means that aircraft don't fly at any point of their route more than 60 minutes from a suitable aerodrome. In the next years, the authorities decided to move forward and authorized aircraft for so-called Extended Twin-Engine Operations (Extended Operations), today is known as ETOPS. Extended operations brought the possibility of flights to extended locations to the aviation industry. At this point, the aircraft was certified to fly up to 6 hours on one engine inoperative in still air. This amount of time is offered to airlines operating flights over the areas where no aerodromes are available. However, the operators could still be forced to fly not the shortest route over the oceanic areas due to missing suitable aerodromes on their route. [1]

Operating an ETOPS requires several approvals and needs to meet specific points to be planned and conducted. The operator needs to have special approval for this kind of operation, which includes also training of flight dispatchers. [2] [3]

The crucial point in flight planning is to plan a network of en-route alternate aerodromes, which can meet all requirements from the legislation site, but also meet desired points from operator needs.

From the initial research of extended operations arrived a question of the usability of all planned diversion locations. Planning an alternate diversion location requires not only assuring the flight operations and safety requirements but also business and flight operational continuity. As an example: in case an aircraft is forced to divert en-route due to mechanical failure to a location that is not able to provide maintenance services a contingency plan needs to be in place to accommodate the passengers and recover the aircraft itself. To determine, plan, and in case of a diversion, provide a successful aircraft and passengers recovery a set of up-to-date information must be in place. Such information package should cover the contacts for the handling, refueling, or medical services and their actual capacities to handle a dedicated aircraft type, that most likely won't be serviced regularly on the selected diversion airport.

This problem of lack of information has been recognized on different levels. The aim of the thesis was to analyze and summarize legislation and practical requirements and requirements for flight planning of diversion airports in EDTO. Similarly, such locations were recognized and

listed based on the actual operational needs of the ETOPS operator. In a summary, this thesis aimed to create an operational handbook for these airports. During research were identified legislation requirements from Federal Aviation Administration and from European Aviation Safety Agency, were also compared together and differences between them were discussed. Following the summary of legislation requirements, the desired data items from the perspective of the operational needs of airline operators have been collected and validated. To validate specific needs for flight planning, a case study was developed. This study has been done by guided interviews with certified Flight Dispatchers from airline companies. After the evaluation of interviews, gained information was collected into one Datasheet which has been used as a base for the Operational Handbook.

The partial goal of the thesis was validating the Operational Handbook. This has been done by analyzing aerodromes, which have been chosen during interviews with dispatchers. This analysis was based on searching the information from available sources e.g., Aeronautical Information Publication, Jeppesen application, commercial websites, websites of specific countries, and so on. During this analysis, the created Operational Handbook has been filled with all the found data and the analysis also approached the current availability of data.

1. Extended-range twin-engine operations

Since the beginning of aviation, the possibility of engine failure or another technical issue has not allowed aircraft fly too far from the alternate aerodrome, so they can land before reaching their destination. In the 1950s, the first regulations were quite restrictive and adopted by ICAO and FAA. The ICAO adopted the so-called “90-min rule” for twinjet operations, based on all-engine cruising speed. The FAA imposed a 60-min rule for two- or three-engine aircraft based on cruising speed with one engine inoperative. Later in the 1960s, three-engine aircraft were exempted. This contributes to a three- and four-engine aircraft to fly long-haul flights, especially over oceans and remote locations. [1]

With technological growth and the invention of new reliable engines came the idea of extended-range twin-engine operations (ETOPS). Initial ETOPS certification was based on the diversion time of 90 minutes. The improvement of airlines, manufacturers, flight crews, flight dispatchers, and other staff in meeting certification conditions for ETOPS came in 1985. Since this year, ETOPS has progressively grown and extended times for each aircraft group. [1]

1.1. Groups of aircraft

1. ETOPS for 120 minutes – Airbus 300, Boeing 737 Classic
2. ETOPS for 180 minutes – Airbus 320 Family, Boeing 737s NG, Boeing 757s, Boeing 767s
3. ETOPS for 240 minutes – Airbus 330s
4. ETOPS for 330 minutes – Boeing 777s, Boeing 787s
5. ETOPS for 370 minutes – Airbus 350

Certification of aircraft can evolve over time and increase (e.g., in the case of Boeing 777 and 787, which have moved from 180 to 330 mins) or decrease subject to technical failures. [1]

1.2. Certification requirements

Initial approval requires an operator to have a minimum of one year of experience with the specific aircraft to gain approval for 120-min diversion time. Another year of operations is required to promote the diversion time to 180-min. [2]

Requirements are straightforward in point-of-flight planning. The route of the flight must remain within the approved diversion time counting only single-engine cruise speed in still air and standard atmosphere condition. Flight planning is considering, among others, fuel, which should be sufficient in case of diversion after one of the following cases occurs at the most critical point of the route:

- Engine failure,
- Rapid cabin decompression necessitating descending to a safe altitude, normally 10.000 ft,
- Engine failure and rapid decompression. [2]

When planning an en-route alternate aerodrome for ETOPS, sufficient aerodromes should be planned in the flight release, ensuring the flight will remain within the authorized maximum diversion time in case weather minima drops down. The pilot-in-command or certified dispatcher must be able to change the flight plan according to in-flight contingencies to another alternate aerodrome. This can be summarized under the required approval for a proven flight planning program and the dispatch program appropriate to ETOPS. [2]

The approval should be also given from the airworthiness site of the aircraft. The whole process of certification is very complicated and is followed according to the Certification of Civil Aviation Product and Parts (CCAR). Requirements included in this section are, for example:

- Assessment of the impact on crew workload and physiological needs during aircraft operation with faults
- Determining and verifying the time capability of each time limited ETOPS significant system
- Alerting the crew when the remaining fuel is insufficient to reach the destination aerodrome but sufficient to complete an alternate landing. [3]

In summary, operational requirements to be validated through the approval process include:

1. A proven flight planning program and dispatch program appropriate to ETOPS
2. Availability of meteorological information and an ETOPS-specific minimum equipment list (MEL)
3. Initial and recurrent training, and a line check program for ETOPS flight operational personnel
4. Assurance that the flight crews and dispatch personnel are familiar with the ETOPS routes to be flown. [2]

With such an improvement, airlines can fly more suitable routes than before because of the shorter distances available. In the case of flights over the ocean, flying the shortest route could still be a problem because not all aerodromes are available for all aircraft or have definite operational hours. When considering routes over the Pacific Ocean, there are many international aerodromes, but not all are able to accommodate every type of wide-body aircraft and handle it in case of disembarkation of passengers needed. For this reason, dispatchers are planning routes with maximum diversion time via large aerodromes, instead of gaining

information from the more suitable aerodrome and then following a great circle track. In Figure 1, it is displayed how the route is planned in case of not following the great circle track. [1]

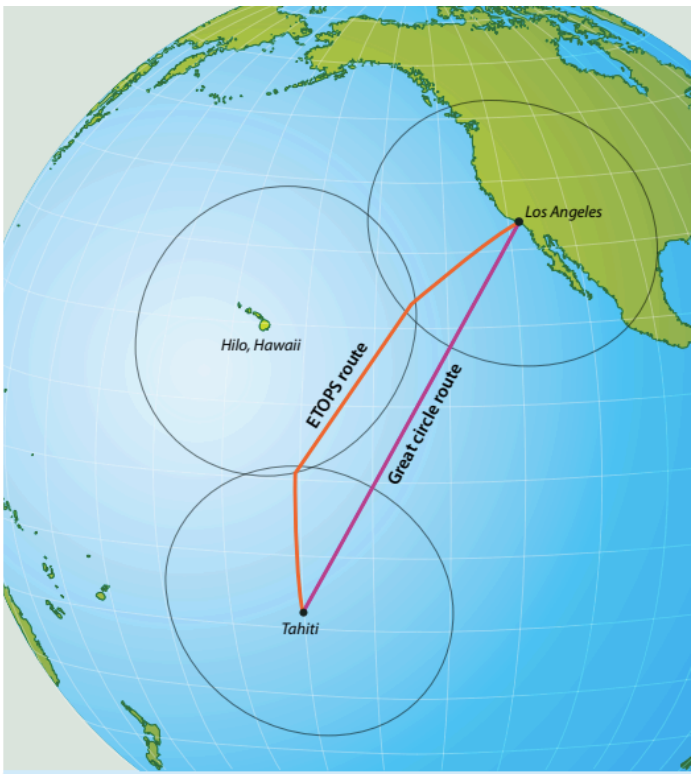


Figure 1 - ETOPS route compared with a Great Circle [1]

Hence, planning en-route alternate aerodrome for ETOPS requires a lot of information, which must be known before commencing a flight safely and without more plausible problems in case of disruption occurs.

2. Legislation Requirements

Flights under ETOPS conditions are operated since the end of the last century and require many conditions which have to be considered and met. Operating an ETOPS flight requires, above all, suitable aerodromes in case of any disruptions or events in which continuing the flight is inadvisable. This situation requires a set of rules for ETOPS en-route alternate aerodromes to meet conditions for planning specific aerodromes in dispatch/flight release. It is in the interest of each company to conduct a safe flight in the shortest route and comply with all the rules. These rules are set by ICAO and adopted by FAA and EASA, which are supposed to be the same or more restrictive for both agencies, as the original rules. [1]

2.1. EASA requirements for ETOPS en-route alternate aerodrome

For the aerodrome to be used as an ETOPS en-route alternate, it is anticipated that in the expected time of possible use of the aerodrome, the weather and field conditions will meet dispatching minima, which are defined below, or the applicable operational requirements. [4]

Dispatching minima En-route alternate aerodrome

An aerodrome can be nominated as an ETOPS en-route alternate for flight planning if available weather forecast at the earliest potential time of landing and ending one hour before the latest potential time of use equals or exceeds the criteria in Figure 2. [4]

Approach Facility	Ceiling	Visibility
Precision Approach	Authorised DH/DA plus an increment of 200 ft	Authorised visibility plus an increment of 800 metres
Non-Precision Approach or Circling approach	Authorised MDH/MDA plus an increment of 400 ft	Authorised visibility plus an increment of 1500 metres

Figure 2 - Dispatching minima [5]

These criteria are applicable for the precision approach Category I. Increments are not applicable for Category II / III, unless specifically approved by the Authority. The approval is based on the capability of the aircraft to operate engine-inoperative Cat II / III landing and approval of the operator to operate under normal conditions Cat II / III. [5]

Among dispatching minima, there are other requirements that should be met for the planning aerodrome as an ETOPS en-route alternate.

1. The landing distance required according to the aircraft flight manual for an altitude of the aerodrome, for the runway expected to be used, considering wind direction, runway surface condition, and aircraft handling characteristics, ensure aircraft can be stopped within the landing distance available. [5]

2. Aerodrome services and facilities are available and can be used for instrument approach procedures to the expected runway while maintaining at least dispatching minima.
3. The latest available weather conditions for the period commencing the earliest potential time of landing and ending one hour after the latest nominated time of use of the aerodrome, equals, or exceeds authorized weather minima mentioned in table one. In addition, for the same period, the forecast crosswind component and any gusts are within operating limits, considering runway conditions and any reduced visibility limits. [4]
4. Operators should provide flight crews with information about adequate aerodromes appropriate to the route, which are not forecast to meet required ETOPS en-route alternate minima. [5]

2.2. FAA requirements for ETOPS en-route alternate aerodrome

In FAA legislation, ETOPS alternate aerodrome is defined as an aerodrome listed in the operation specification of the holder's certificate, which meets requirements specified in 14 CFR 121.624 and Rescue and Fires Fighting requirements of 14 CFR 121.106 planned in dispatch/flight release for use in a situation, when aircraft is en-route to the destination as ETOPS and continuing flight is inadvisable. [6]

According to FAA legislation, nobody may list an aerodrome as ETOPS en-route alternate in dispatch/flight release unless it meets for a period of earliest time and ends at the latest time of possible landing criteria below:

1. The appropriate weather reports or forecast indicate that the weather conditions will be at or above the ETOPS en-route alternate aerodrome minima specified in the certificate holder's operations specification,
2. A condition field report is ensuring a safe landing can be made,
3. all ETOPS en-route alternate airports within the authorized ETOPS maximum diversion time are reviewed and the flight crew is advised about any changes that have occurred since dispatch. [6]

If criterion 1 can't be met for a specific aerodrome, the dispatch/flight release can be amended and a new aerodrome within maximum ETOPS diversion time can be added and authorized for that flight in case it meets weather conditions at or above the operating minimum. [6]

Any ETOPS en-route alternate aerodrome can be listed in dispatch/flight release unless it meets the criteria for public protection. That means when aircraft are operating in the Southern/Northern Polar area or ETOPS beyond 180 min, facilities at the airports or in immediate are sufficient to ensure the protection of passengers from the elements and to see to their welfare. [6]

2.3. Differences

Based on the summarization of legislation requirements of these two authorities, it is possible to see many differences between requirements for operation under FAA or EASA.

The significant point is in defining the ETOPS en-route alternate aerodrome. In EASA requirements it can be any aerodrome, which meets weather and field condition for a period of the earliest possible landing and end one hour after the latest time of possible use. For FAA operation, this should be an aerodrome included in the certificate holder's operation specification, where the period of possible use is shortened to one hour in the end.

According to the weather forecast, EASA regulation is more specific. In implementing rules and Acceptable Means of compliance, tables with specific dispatching minimums are shown. From the side of the FAA, there are again only mentioned conditions specified in the certification holder's operation specification.

An interesting difference to be pointed out is from the FAA requirement for public protection, which is not included EASA rules.

From an overall view, the requirements are more specific from EASA's side than FAA's, where EASA produces Requirements from the section Air Operations – Special Approval Acceptable Means of Compliance, which can be found in AMC 20-6.

3. Overview of aircraft ground operations

In the previous chapter, legislation requirements for alternate aerodromes were discussed. However, these rules are only for commencing the safe landing of the aircraft but don't include any other actions for aircraft ground handling. After touchdown, the aircraft is required to taxi safely to the apron, where the process of ground handling starts. In the following subchapters, basic ground support equipment (GSE) desired for ground handling will be introduced.

3.1. Stand

To start the ground operation, the aircraft must park at the stand, which is suitable for its safe operation. Aircraft can be parked directly at the gate or at the remote stand position (Figure 3).

The design of a suitable stand depends on the aircraft's wingspan and the length of the fuselage because it's necessary to create a safety perimeter. A safety perimeter is created by connecting all extreme points of the aircraft and inside are allowed to move only vehicles and persons directly involved in ground handling. [7]

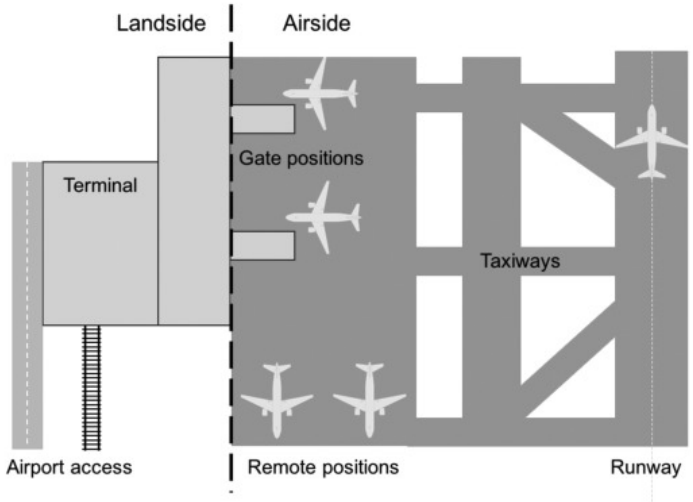


Figure 3 - Apron positions [35]

3.2. GSE set up

To start any ground handling around the aircraft, GSE must be set up correctly to ensure safe operations and allow all procedures without any problems.

Ground power unit

After inserting the chocks, the Ground Power Unit (GPU) must be connected to the aircraft for the power supply to successfully shut down the engines and auxiliary power unit (APU). The GPU can be of many types, f. e. portable, a part of a jetway, or static in the apron. [7]

3.2.1. Jetway, air stairs

When the aircraft is parked safely, GPU is connected and a safety perimeter is created, the jetway or air stars can be set for the disembarkation of passengers. Depending on the aircraft type, stairs are usually placed on the left forward and aft side of the aircraft. In case of gate position, the jetway is placed to the forward doors, and additionally if required, air stairs are placed to the aft part. [35]

Another option is aircraft-integrated stairs which are used on the remote stand and don't need any setup from ground handlers.

In the process of disembarkation, it is necessary to consider passengers with reduced mobility. In case of wheelchairs not able to climb stairs or who are not able to walk at all is desirable to have a vehicle, which helps these passengers to disembark or board the aircraft. This vehicle can be positioned to the front or aft doors and should not block the disembarkation of other passengers. [7] [35]

3.2.2. Preconditioned air unit

In case of an unpleasant climate, a unit for the air condition of the aircraft can be required. This unit is again of many types and can be part of a jetway, built in the stand, or as an external vehicle. Nevertheless, the air condition unit is not necessary for ground handling but is part of GSE, which can be required by the operator. [35]

3.2.3. Belt/Cargo loader

Simultaneously with stairs is set up of belt/cargo loader for loading or unloading of baggage and cargo. Depending on the aircraft, belt loaders are used for loose loads and cargo loaders are for unit load devices (ULDs). [35]

3.2.4. Lavatory and potable water

To fully handle the aircraft, potable water can be required to be filled. This procedure is not necessary, because the aircraft can have suitable savings from arrival, and action is done only on request of the operator or flight crew.

Same procedure as potable water is the lavatory, which services wastewater out of the aircraft. This action should be done after the potable water is filled due to hygienic standards and again on request of the operator. [35] [7]

3.2.5. Fueling

All actions mentioned above can be done simultaneously with the disembarkation or boarding of passengers. On the contrary, the refueling of the aircraft is processed after the last

passenger disembarked from the aircraft, according to requirements stated in EU-OPS. Refueling is acceptable to do during boarding, but special procedures must be followed, and more people should be informed. [35]

3.2.6. Tow bar, tow tractor

When all desired procedures are done and the aircraft is ready for departure, all chocks are removed. In the case of the remote stand, the aircraft is usually able to move without any help from the ground vehicle. In the case of gate position, the necessity of a tow bar or tow tractor is in place. Not all aircraft are able to be pushed back by a tow tractor and a tow bar should be used. [35]

3.2.7. Cold weather protection

Sometimes airports are in latitudes, where the weather is not suitable all year for safe operations without cold weather protection. In case of such weather, the aircraft must be protected by de-icing or anti-icing fluid, ensuring safe take-off and departure. This procedure is normally done on the specific stand, where the remaining fluid from operations safely goes to some water purifier.

For the imagination of GSE equipment set up during the handling see the layout for gate position in Figure 4.

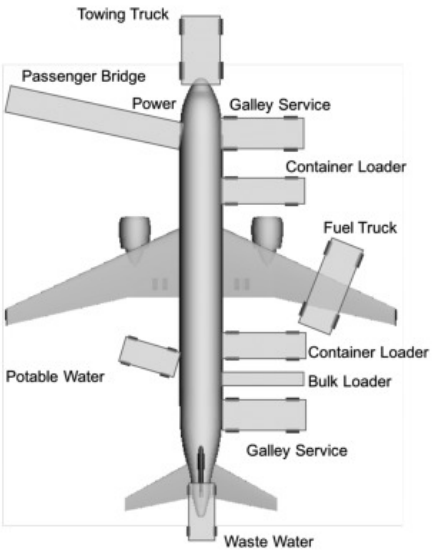


Figure 4 - GSE set up [35]

4. Facilitation

From the most elemental point, facilitation is moving things and people across international borders. As the technology of the twenty-first century develops, facilities are helping to prevent the movement of undesirable, while making routine and necessary objects easier. [7]

ICAO's standard-setting is well understood from the point of Safety, Security, or Air navigation. However, the standards and recommendations practices (SARPs) in relation to facilities are left behind. The Chicago Convention tasks ICAO to develop SARPs for facilities in the field of Customs and Immigration procedures. This role is reflected in ICAO's Strategic Priorities, one of which is "Enhance global aviation security and facilitation". [7]

Annex 9 is one of the adopted annexes of The Chicago Convention, which contracting states must comply with, considering set SARPs. The Annex had adopted 25 Amendments until the year 2015. In February 2016, it became an applicable fourteenth edition of Annex 9. This Annex contains a range of subjects, including which are procedures for entering aircraft and their passengers and cargo, international airport facilities, and passport and visa requirements. [7] [8]

4.1. Immigration control

For authorities to be sure, who is attempting to leave or enter, most states have immigration control. This control is providing outward passport control, where authorities verify the identity of passenger and records their departure. [7]

In such countries as the USA, Canada, or the UK, authorities do not have outward passport control, however, there are requiring airlines to report passenger information lists to immigration authorities. [7]

Entering the contracting state is usually followed by an immigration check by government authorities. Depending on the level of equipment and procedure, the verification is done in different ways. The oldest way is a face-to-passport check and verifying that the passenger meets eligibility requirements not to be refused from entering by humans. As ICAO recommends, many countries are using Machine readable travel documents and search via electronic means. Advanced technologies allow the usage of automatic controls, where passengers go through self-control using biometrical control using fingerprints or facial recognition. [7]

Verification of the identity of the passenger goes hand-in-hand with the visa regulations of each state. The World Tourist Organization has been requesting the removal of entering visas to all countries globally, but they remain an integral part of immigration control. [7]

Considering emergency situations, which are caused by the Majeure force, special assistance is needed. Annex 9 is counting on these contingency situations and recommends practices to establish measures for such situations. The state should temporarily allow passengers or crew member to enter their territory even if they don't possess the required visa prior to arrival, due to diverting of a flight for any reasons of force majeure. Out of recommended practice is point 3.73 from Annex 9, Chapter 3, which says: "Contracting States shall establish measures whereby in-transit passengers who are unexpectedly delayed due to a flight cancellation or delay may be allowed to leave the airport for the purpose of taking accommodations." [8] [7]

From this point of view, immigration authorities shall be informed of every upcoming disruption, which is going to occur in the next hours, and have established measures. [8]

4.2. Customs

Following the immigration check, passengers are proceeding to the baggage reclaim hall for customs clearance of their checked baggage. While immigration is focusing on entering people into contracting countries, customs are related to things, particularly restricted substances or goods. Different countries have different priorities, but most customs checks are focused on the main things:

- Preventing the smuggling of illegal drugs,
- Blocking the trade of restricted items such as antiquities, ivory, or diamonds,
- Enforcing import bans of items such as weapons,
- Amount of alcohol and tobacco. [7]

The procedure is again different in many countries. Some countries are relying on the self-declaration of passengers, where many of them are going through the green zone with "nothing to declare". On the contrary, some other states are using methods such as X-rays, sniffing dogs, searching, or asking passengers questions to seek to identify contraband substances. [7]

4.3. Quarantine control

Quarantine control was usually implemented by small numbers of states around the world, while Immigration and Customs are commonplace. Quarantine control is aimed at states geographically more isolated, to prevent the entry of diseases, pests, and states in extended locations. For example, Australia and New Zealand have more strict quarantine requirements as they are geographically isolated from different pests and diseases. [7]

In the year 2019, quarantine control was underestimated to the point of spreading diseases and grew into a World pandemic. The disease COVID-19 was spreading all over the World

and caused hundreds of thousands of deaths. Beginning of the pandemic, air traffic almost stopped to zero, and countries closed their boundaries. With recovering from this air traffic ban, many countries involved quarantine control for passengers, who have symptoms of COVID-19 or were in contact with somebody who had so. Figure 5 shows, where quarantine was applicable for passengers traveling from high-risk regions or only screening was in place. [9]

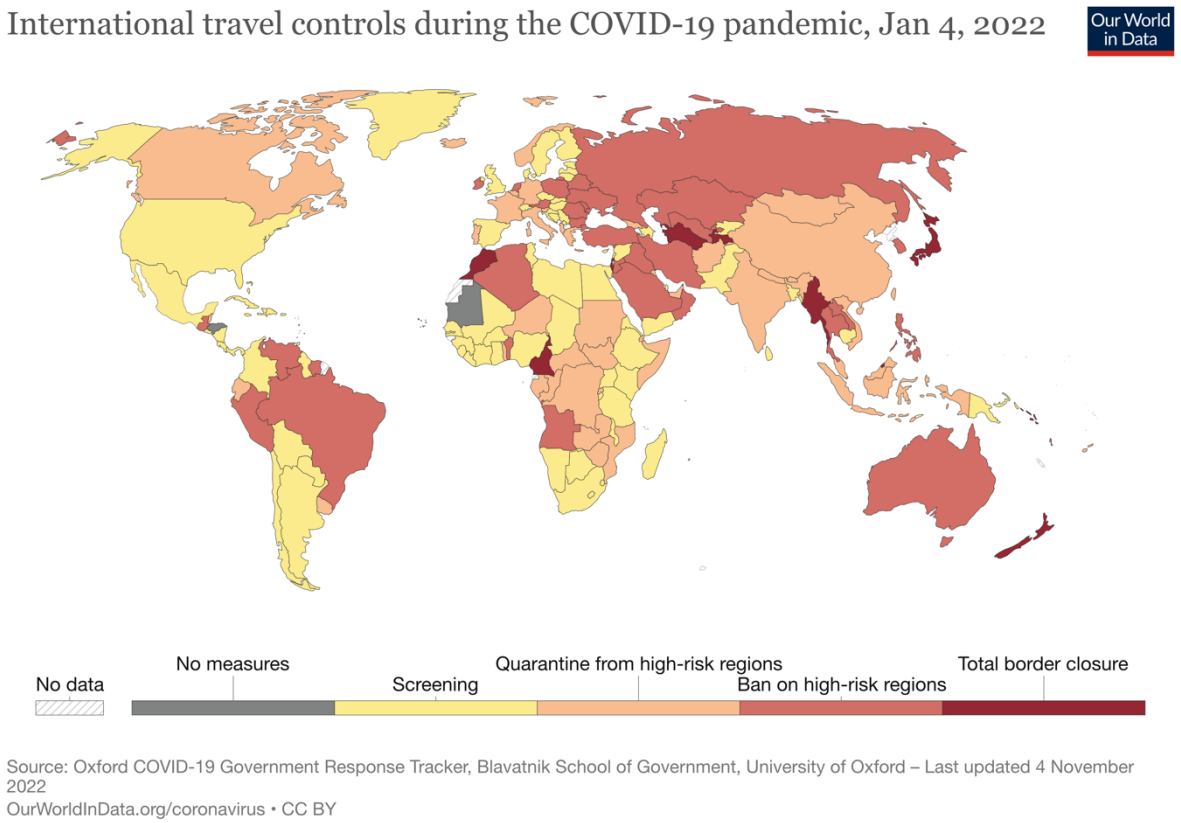


Figure 5 - Applicability of quarantine in January 2022 [9]

5. Aeronautical Information

Safety plays a key role in air traffic operations. Maintaining standards and a certain level of safety means following rules and procedures set by aviation authorities. Following rules in the air is more than required to not cause any incident or accident and be able to land safely in all ways. Nevertheless, after landing, taxiing and ground handling of aircraft is also part of air traffic operation, which requires specific procedures to be maintained. To follow these rules around the World, different means of compliance are set. [10]

All this information regarding air traffic operation, Aeronautical Information (AI), is published in Aeronautical Information Publication (AIP). AIP is a comprehensive publication containing

everything from airspace layout to facilities in the aerodrome. Every country has its own document, where all specific procedures related to each aerodrome are published. If there are temporary changes in AIP, for example, closure of the runway or unavailability for ground handling of specific aircraft, all parties should be notified. This notification is done via NOTAM (Notice to Air Mission) and/or AIP Supplement. [11]

5.1. General information

Aeronautical Information is information regarding air traffic. It covers all information from airspace layout, through obstacles near the airport to operational hours. Basically, It covers information that you can need for the operation of a large jet in commercial air traffic or small propeller aircraft in general aviation. The responsibility of maintaining AI up to date belongs to Aeronautical Information Service. [10]

All member states of the ICAO (International Civil Aviation Organization) shall provide Aeronautical Information Service (AIS). The state can provide the service or choose to have a joint service with other states or delegate the provision of the service to a non-governmental agency, provided the Standards and Practices of Annex 15 are adequately met. The aim of AIS, the service that provides AI, is “to ensure the flow of aeronautical information/data necessary for safety, regularity, economy, and efficiency of international air navigation” (ICAO, 2013). [10] [12]

The information in AI is divided into permanent and temporary information. Where the permanent information is often distributed in paper (or electronic format) and not updated very often, the temporary information needs to be checked before every flight. AI is divided as follows:

- The permanent information consists of Aeronautical Information Publication (AIP), AIP Amendments, and AIP AIRAC (Aeronautical Information Regulation And Control) Amendments.
- The temporary information consists of AIP Supplement, AIP AIRAC Supplements, and different NOTAM.
- Information that does not qualify for inclement in the above is called: AIC (Aeronautical Information Circular). [10]

All AI shall be included in the Integrated Aeronautical Information Package (IAIP). This IAIP is used when exchanging AI between states and can be in paper or electronic form, or both. IAIP contains AIP with amendments and supplements, AIC, NOTAM, Checklist and

list of valid NOTAMS, and Pre-Flight Information Bulletin (PIB). The scheme is displayed in Figure 6. [10]

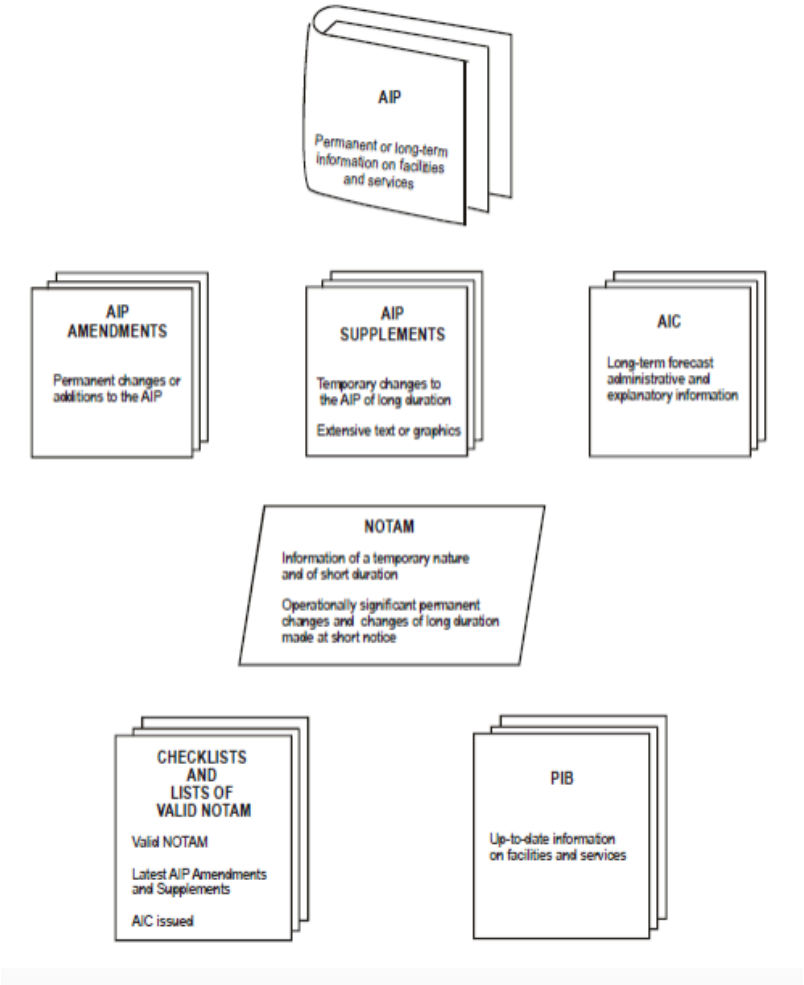


Figure 6 - Scheme of IAIP parts [10]

5.2. Aeronautical Information Publication

An Aeronautical Information Publication (AIP) is a publication issued by or with the authority of a State and containing aeronautical information of a lasting character essential to air navigation. [13]

The structure of AIP is standardized by international agreement through ICAO. AIP is normally divided into three parts:

1. GEN – The first part consists of non-specific information about services, national regulations, and requirements or charges for airport/heliport and air navigation services.
2. ENR – Enroute part includes for example general rules and procedures, navigation aids and services, navigation warnings, or oceanic operation.

3. AD – The aerodrome part presents all information about international aerodromes of that country. In this part can be found General information about the location of the aerodrome, handling facilities and airport authorities, information about runways, and all necessary local procedures. [11]

5.3. AIP Amendments or Supplements

AIP Amendments are permanent changes to AIP. There are two different types of amendments. AIP Amendment and AIP AIRAC Amendment. The main difference between them is, that AIRAC Amendment is operationally significant, which means impacts daily operations and may even affect safety. Therefore, AIRAC has a set of dates by ICAO, which are unifying all updates. [10]

The AIRAC update must be posted many days before its effective, depending on the severity of the change. Major changes must be posted within 56 days, before taking effect and normal changes have a minimum of 42 days. Then each AIRAC is published every 28 days. [12]

In Figure 7 are the agreed dates for past and future years of AIRAC publication.

2020	*2021*	*2022*	*2023*	*2024*
2020-01-02	2021-01-28	2022-01-27	2023-01-26	2024-01-25
2020-01-30	2021-02-25	2022-02-24	2023-02-23	2024-02-22
2020-02-27	2021-03-25	2022-03-24	2023-03-23	2024-03-21
2020-03-26	2021-04-22	2022-04-21	2023-04-20	2024-04-18
2020-04-23	2021-05-20	2022-05-19	2023-05-18	2024-05-16
2020-05-21	2021-06-17	2022-06-16	2023-06-15	2024-06-13
2020-06-18	2021-07-15	2022-07-14	2023-07-13	2024-07-11
2020-07-16	2021-08-12	2022-08-11	2023-08-10	2024-08-08
2020-08-13	2021-09-09	2022-09-08	2023-09-07	2024-09-05
2020-09-10	2021-10-07	2022-10-06	2023-10-05	2024-10-03
2020-10-08	2021-11-04	2022-11-03	2023-11-02	2024-10-31
2020-11-05	2021-12-02	2022-12-01	2023-11-30	2024-11-28
2020-12-03	2021-12-30	2022-12-29	2023-12-28	2024-12-26
2020-12-31				

Figure 7 - Agreed days for AIRAC publication [12]

5.4. AD – Aerodrome

The Aerodrome section is one of three parts of AIP, which contains specific information about aerodromes/heliports of the publishing country. All information should be up to date and maintained by the declared authority. [14]

Some general information is mentioned in the first part of AIP, GEN – general, but it's only general information for the country. This information is later more specifically described in part AD, where should be all procedures, names, and contact to a responsible person. [10] [14]

According to ICAO Specimen AIP, a section of the Aerodrome should include the following information:

- Aerodrome location indicator and name,
- Aerodrome geographical and administrative data,
- Operational hours,
- Handling services and facilities,
- Passenger facilities,
- Rescue and firefighting service,
- Aprons, taxiways and check locations/positions data,
- Surface movement guidance and control system and marking,
- Aerodrome obstacles,
- Meteorological Information Provided,
- Runways' physical characteristics declared distances and lighting system,
- Helicopter landing area,
- ATS airspace and ATS communication facilities,
- Radio navigation and landing aids,
- Local aerodrome regulation and noise abatement procedures,
- Flight procedures and charts related to an aerodrome,
- Additional information. [14]

According to the Aeronautical Informational Services Manual (Doc 8126, Vol III) the arrangement and format of AIP should be organized as close as possible to the AIP Specimen format. This format ensures uniformity of all AIPs over the contracting states of ICAO and besides it helps users to reduce the workload for handling many of AIPs when needed to find some specific information. [14]

6. Method of research

Flight planning contains many requirements from the legislation site, but also from the airline's operational point of view. As mentioned in previous chapters, almost all necessary information should be included in an AIP of a specific country. Contracting countries of ICAO are responsible for their publication and must maintain it up to date according to requirements of published AIP Specimen from ICAO.

In-point of facilities and handling services, there is no such specification of what should be included. It's only up to authorities if they include specific information or how they will maintain their publication. In general, only basic information is required (see Figure 8).

EADD AD 2.4 HANDLING SERVICES AND FACILITIES

1	*Cargo-handling facilities*	Trucks 1.5–3.5 tonnes. Up to 10 tonnes handling possible.
2	*Fuel/oil types*	Jet A1, AVTUR, AVGAS 100 LL, oil, all types normally available.
3	*Fuelling facilities/capacity*	1 truck 45 000 litres, 50 litres/sec.
4	*De-icing facilities*	Available. See AD chart for location.
5	*Hangar space for visiting aircraft*	Limited, by prior arrangement only.
6	*Repair facilities for visiting aircraft*	Available for aircraft up to 5 700 KG. Major repairs by arrangement.
7	*Remarks*	Handling services available within AD HR or by arrangement with the AD.

Figure 8 - AIP ICAO Specimen [14]

The aim of this thesis is to identify the main requirements based on the legislation from ICAO adopted by EASA and FAA. Identified requirements will be included in the list of items, which the Flight dispatcher shall know before planning the aerodrome as an ETOPS en-route alternate. As mentioned in previous chapters about GSE and Facilitation, many aspects should be considered from these fields, as they are not obligatory but highly recommended. These aspects were identified from scientific articles and literature about Airline Operations. Both groups, the Legislation with Operational needs, will be categorized in one table and create a base for the Operational Handbook, which should be done at the end of this thesis.

6.1. Case study

A case study is an in-depth study of one person, group, or event. This method develops a complete understanding of a process, event, or activity. The goal of this type of study is to develop a comprehensive understanding of the case, including the context and the circumstances in which it occurs through extensive description and analysis. A common case study approach is reliance on data collection from multiple sources, particularly first-hand observation. [15]

This study has benefits and limitations. The advantage of a case study is allowing the researcher to collect a great deal of information, gives information on rare or unusual cases, or permits the researcher to develop hypotheses that can be explored in experimental research. On the contrary, the negative side of the study is the inability to be generalized to a large population, cannot demonstrate cause and effects, cannot be scientifically rigorous, and can lead to bias. [15]

It can be designed to meet a variety of goals but generally fall into one of four categories.

- **Exploratory** – The case study is aimed at defining the questions and hypotheses of a subsequent and larger study. These are sometimes used as a prelude to further, more in-depth research. [16]
- **Explanatory** – The study focuses on establishing a cause-and-effect relationship, explaining which causes produce which effect. In other words, researchers are interested in looking at factors that may have caused certain things to occur. A case study with humans or groups would not be Explanatory, as with humans, there will always be variables. [16]
- **Descriptive** - These involve starting with a descriptive theory. The subjects are then observed, and the information gathered is compared to the pre-existing theory. [16]
- **Instrumental** – This case study occurs when participants, individual or group, allow researchers to understand more than what is initially obvious to observe. An example of an instrumental case study is focusing on the result, not on the topic. [16]

6.1.1. Key steps in the case study

Researchers go through the four primary steps in any case study project: designing the study, conducting the study, analyzing the data, and preparing the results. [16]

Designing the study

When designing the case study, first, it is to prepare research questions that will be addressed to the subjects of interviews. Understanding the context requires reviewing possible literature and sources to accumulate evidence related to the goals. [16]

The second step is to develop a framework to structure specific research questions that will be addressed to subjects. This step is critical because there is no common set of questions for case studies that can guide data collection. [16]

Determining the unit of analysis is the next step in designing the study. The unit of analysis is closely determined by initial research questions. In some cases, it can be straightforward, but another can be difficult to identify. [16]

Conducting case study

Conducting an in-depth study is on the contrary opinion not so easy, quick, and requires a long time to collect all data. However smaller case studies are appropriate and sometimes are less time-consuming and easier to develop. Nevertheless, conducting it stays the same.

The preparation of the case study includes establishing clear protocols and procedures in advance of the fieldwork. Second, it requires the researcher to prepare all questions clearly, understand the work field perfectly, and familiarized themself with possible questions to be asked. [16]

Analyzing the data

The case study can generate a large amount of data that should be analyzed sufficiently. The first step is to create a database of qualitative and quantitative data collected. It could be noted from interviews or quantitative data for program processing. The analysis phase should include sorting data in different ways to create insights and look for conflicting data. This could be done by several methods to identify findings and work toward a conclusion, such a

- Analyzing information within each case for themes and then across all cases of themes that are either the same or different,
- Examining how data collection and analysis findings compare to original expectations and hypotheses,
- Ensuring that analysis addresses all major rival interpretations so that these can be ruled out or targeted for additional study.

The data analysis ends when the best possible fit has been reached between observations and interpretations. [16]

Preparing the report

A case study should report data in a way that transforms a complex issue into one that can be easily understood. It should allow the reader to question and examine the study and reach an understanding independent of the researcher. [16]

Important in the report of the case study can be a review of results to gain validation of the key information it presents. The review should be done with participants and respondents to verify the presented facts in the case. Respondents and participants can disagree with specific conclusions, it is crucial for basic information to be correct about each presented case. [16]

6.2. Creation of handbook

To completely understand the problem of choosing an ETOPS en-route alternate aerodrome and gaining desired information about them, the Instrumental case study was developed and applied to dispatchers, who are directly involved in the active planning of the flights with extended diversion time operations.

The basic model of four key steps was applied to completely understand the situation and show up the necessity for the creation of the Operational Handbook.

6.2.1. Designing the case study

First, it was necessary to understand the problematic legislation requirement from ICAO, which is binding for all contracting states and shall be followed by all countries and the organizations involved. The identification of basic legislation requirements in chapter two was found and completed with differences from Federal Aviation Administration and European Union Aviation Safety Agency. These differences are mandatory in preparing the questions for the interview because both organizations adopted different means of compliance to follow set rules by ICAO and respondents can be chosen from companies involved in flight planning under FAAs rules or under EASAs one. From this evaluation came the first question when asking respondents in the survey:

1. *Do you have a list of ETOPS en-route alternate aerodromes for flight planning available in your organization?*

This question is directed to dispatchers, who are responsible for flight planning of EDTO flights under the law of the FAA. This question can be answered *YES* or *NO*. Depending on the answer of each respondent, small talk was performed with specific questions and all answers were noted and included in the analysis of data.

From the literature and accessible scientific articles was found, that not always the shortest routes are planned [1]. To plan the shortest route, an aircraft should follow a Great circle track which is sometimes limited by available facilities and political situations. Therefore, the next question is asking about avoiding some aerodromes:

2. *When only a military aerodrome is available on the shortest route, would you rather plan a bit longer route with a civil aerodrome?*

By asking this question supposed to find out if dispatchers are avoiding the planning of aerodromes, which are suitable for landing, and hence the aircraft would be able to fly the shorter, less time-consuming, and profitable route. The question could be answered again simply *YES* or *NO.* If some respondents need to discuss their answer, which is only partially yes or no, notes were written. As the following questions will be opened for opinion, respondents were asked to briefly answer a question and leave more notes until the end of the survey.

When considering items of research, from the side of Airline Operations there are many desired aspects from ground support equipment and field of facilities on the aerodrome. To evaluate. The question about Ground handling was conceived as a closed, polytomous question. In other words, the respondent had the possibility to choose from more than one answer and didn't need to justify it.

3. If the aerodrome is planned as an ETOPS Enroute alternate, choose all desired information you are looking for from the options below.

The question was indirectly related to the first question, for the reason of including some aspects of legislation requirements. The question covers twelve possible options to choose from. Available answers are:

- Runway characteristics
- Lavatory service
- Meteorological office contact
- Immigration
- RFFS Category
- Passenger handling company
- Flight station service
- Catering service
- Fueling Company
- Terminal Capacity information
- Information about Hotels near the aerodrome

- Aerodrome Authority

Question number three is directly followed by question four with its content. It is covering the needs of specific Ground Support Equipment for operated aircraft. A single GSE was identified, but some of them could be less relevant as “must have” than others one. For this reason, was again asked polytomous questions with multiple answers:

4. *Which type of Ground Support Equipment you are looking for in point of availability?*

Multiple answers were able to choose from the options below. All these aspects are relevant for the ground handling of a wide-body aircraft before every flight. Depending on the need to transfer passengers and their belongings to another aircraft, dispatchers were asked to choose the most needed equipment.

- *Ground Power Unit (GPU)*
- *Air Stairs*
- *Air Start Unit*
- *Container Loader / Cargo Loader*
- *Lavatory truck*
- *Potable water truck*
- *Belt Loader*
- *Tow bars / Tow tractor*
- *Air Condition Unit*
- *De-ice trucks (if required at destination)*

Question number five is one of the most important from the interview with dispatchers. It's asking about the availability of the information. This statement could confirm or reject the statement about the necessity of the operational handbook.

5. *Is all information required for the planning of ETOPS en-route alternate aerodromes available in one place?*

Before asking a question to dispatchers, the decision between the dichotomous or polytomous type of question had to be done. If choosing a dichotomous question, dispatchers are allowed to answer only *YES* or *NO, Agree* or *Disagree*. On the contrary, a polytomous question offers an escape answer *SOMETIMES*, which leads to an additional question or next explanation. So, choice *Sometimes* was added.

The next two questions were created to determine which sources dispatchers are using to gain all the needed information they have chosen in questions three and four, and their availability.

As identified in the chapter 5 of this thesis, the Aeronautical Information is included in the AIP of a specific country and should be maintained up to date. If not so, dispatchers should choose some other options from where to take the rest of the information.

6. *For any required information I am using:*

- *Internal information of a company,*
- *AIP of a specific country,*
- *Information based on the country's website,*
- *Personal contact (email/phone).*

7. *When looking for the required information, the availability of contacts is:*

Previously asked questions pointed to availability and sources of information. Hand-by-hand is the following question about their accuracy. It's asking about the availability of the published contacts and names of the main person/persons of concern (POC). Answers were again set as in question number five to choose a direct opinion if availability is SUFFICIENT or *INSUFFICIENT*, but an escape answer was included and hence led the interviewer to know more about this problem and to have another suggestion to create a list of information, which could be helpful. Therefore, the possible answers were as follows:

- *Sufficient*
- *Hard to find, but accessible*
- *Insufficient*

During the research, interest was in the summarization of the Aeronautical information. Legislation and scientific articles mentioned that the AIP of a specific country should include all information at least about all international aerodromes. As a randomly chosen unnamed aerodrome from the website Flightradar24.com in the middle of the ocean, the assurance about its international status has been done, and then its AIP was searched. Directed by the official website of EUROCONTROL was found an AIP, which was effective from April 2002, and the last published Circular was from February 2021 (in August 2022). This finding led to give the next question:

8. *Do you have sufficient information from the publication when using the AIP of an aerodrome in extended locations?*

To answer the question, only the options *YES* or *NO* were chosen.

In question number two was mentioned that the problem of planning the shortest routes will be discussed later in the survey. Meanwhile, question number two is asking about decision-

making about civil and military aerodromes, question number nine is asking only if the nearest available aerodrome to a great circle is planned or not.

9. *Do you always use the best available aerodrome on the way, or do you have to choose another due to any reason?*

- *Always the best*
- *Another less suitable*

The question could seem to be dichotomous with only two available answers. Nevertheless, this kind of question is called a possible question. It is directed to specific respondents who can answer *Always the best*, which ends as a result. The answer could be *Another less suitable* and if respondents choose it, they will be asked immediately with next question:

10. *If choosing a less suitable aerodrome, what is the reason?*

Question number ten is first from all thirteen questions, which is open. Respondents can answer as they want without options from the interviewer. They should be only asked to answer with a few sentences instead of a long explanation.

All previous questions are desirable for the identification of necessary services and facilities. To prove, that an operational handbook is required, and the present situation of data availability Is not as it could be, decision to do an analysis of a few aerodromes that were identified as suitable for EDTO flight planning was done. A list of aerodromes was identified during a group project at Czech Technical University in Prague and used during interviews as a direct question:

11. *Which aerodromes from the available list would you choose for the planning of common flight routes?*

A task for dispatchers was to choose some aerodromes from the Pacific Ocean, the North and the South Atlantic Ocean, Africa, and the Indian Ocean. Polar, Russia, and surroundings were excluded from this research as it could be a real limitation in gaining some information and it could lead to some suspicious cases due to the Russian invasion of Ukraine.

As an Instrumental case study, the last two questions are also conceived as open to understanding problematics which is not obvious and wasn't yet determined.

12. *Is there some other kind of service, which is not mentioned in questions 3 and 4, and in your point of view is desired?*

A Supplementary question for questions three and four is the twelfth one which is asking about anything that wasn't mentioned and offered in the options of previous questions. The answer to it is not necessary because if research was done precisely, all desired aspects should be identified previously.

Finally, the last question is covering a subjective point of view from respondents. The simple question includes a hidden answer, and basically, the purpose is to know if somebody from all respondents will request or appreciate any Operational Handbook, which should be among other results from this interview.

13. *As a Flight Dispatcher, would you recommend something to improve for better operations and dealing with diverted flights?*

6.2.2. The unit of analysis

Conducting this case study, the unit of analysis was chosen as qualitative and straightforward, rather than quantitative. It means five dispatchers were asked to meet for an interview and answer twelve questions, which were designed in the previous chapter. This process was chosen to maximalist the usefulness of gained results from a small sample of answers. The dispatchers were chosen also by their specialization for ETOPS flight planning which needs specific training and information that could be considered unique. [2]

The interviews were remote mainly via ZOOM calls or MS Teams. Before each interview, all respondents were assured that their identity remains anonymous. Three dispatchers were asked from the company Euro Jet which provides on-the-ground personnel for different aviation services. The other two were asked from United Parcel Service company, which is involved in cargo transportation and uses a Boeing 767 and 757 for intercontinental flights.

6.2.3. Conducting case study

With designed questions for the interview, all chosen respondents were asked for a meeting. This meeting was usually agreed upon via online call due to a lack of time for a personal meeting or the location of a dispatcher in the United States (USA).

Each interview was estimated for 30 minutes, which was usually reached. To avoid previous delays or unclear answers, the list of aerodromes for answering question number 11 was provided before the meeting started. All dispatchers had the possibility to prepare for their answer and don't have to decide between time pressure.

Question 1: *Do you have a list of ETOPS en-route alternate aerodromes for flight planning available in your organization?*

R1:,, Yes, we do have."

R2:,, Yes, there are aerodromes that we don't even use."

R3:,, Sure we have one."

R4:,, As it is required, we do have. But we are planning still the same routes, so we are using only a few specific aerodromes."

R5:,, Yes we have some. But scheduled flights are planned usually on the same routes, so we are only assuring ourselves if there is any restriction."

Question 2: *When only a military aerodrome is available on the shortest route, would you rather plan a bit longer route with a civil aerodrome?*

R1:,, Yes, there is just a little chance of aircraft diversion, so why not."

R2:,, I would not avoid it if it meets all requirements for a safe landing. Also, I would prefer to know, if it is able to handle the aircraft and accommodate passengers in case of need."

R3:,, Depending on the situation. When it is only the aerodrome on the route, I would be patient about it and try to find out information about the facilities there. But if I have to choose between civil and military, I will prefer civil aerodrome."

R4:,, It is a suitable aerodrome as others are. So, I wouldn't plan a longer route."

R5:,, Yes, I would use the military aerodrome."

Question 3: *If the aerodrome is planned as an ETOPS Enroute alternate, choose all desired information you are looking for from the options below.*

R1:,, For sure I would choose Runway characteristics, meteorologic information, RFFS, Flight Station Service, and Aerodrome Authority. Would say these are the most important points. Other useful points I would choose Fueling and Ground handling company, and customs with immigration service. The rest are not so required in my point of view."

R2:,, Options 1,3,5,7 (Runway characteristics, MET Office, RFFS, FSS) are desired for every flight, so there is no discussion. Options 6,9 and 12 (Ground Handling, Fueling, Aerodrome Authority) i am looking whenever the aerodrome looks suitable for landing. Finally, I would choose options 4 and 10 (Immigration and Terminal Capacity)."

R3:,, From the offered points I would choose 9/12. From the top of a list, I would choose Runway characteristics, Meteorological office contact, Immigration, RFFS category, Passenger handling company, Flight Station service, Fueling company, Terminal Capacity information, and Aerodrome Authority."

R4:,, As a dispatcher for a cargo company, I don't see the necessity to look for any passenger services. So from points available for dispatching a would need runway characteristics,

meteorological office, RFFS category, Flight station service, Fueling company, and Aerodrome authority. The rest could be important, but as we are not planning passenger flights, I don't know the necessity of these services."

R5:,, Runway characteristic, Meteorological office contact, RFFS category, Flight Station service, Fueling company, and Aerodrome Authority. These points I would be interested in."

Question 4: *Which type of Ground Support Equipment are you looking for in point of availability?*

R1: ,, GPU, Air Stairs, Cargo Loader, Belt loader, Tow Bars"

R2: ,, GPU, Air Stairs, Air Starter Unit, Belt Loader, and Tow tractor."

R3: ,, GPU, Air Stairs, Air Starter Unit, Cargo Loader, Belt Loader, Tow Bars."

R4: ,, GPU, Air Stairs, Cargo loader, Tow tractor."

R5: ,, GPU, Air Stairs, Air Starter Unit, Cargo Loader, Tow tractor."

Question 5: *Is all information required for the planning of ETOPS en-route alternate aerodromes available in one place?*

Surprisingly four from five respondents answered straightforward *NO*. Just one said Sometimes. All of them were asked to shortly explain why they chose so, or at least how many sources they are forced to use to fulfill all requirements.

R1: ,,… not at all, if we are talking about planning an aerodrome for the first time, it is necessary to use more sources."

R2: ,,… as we are using an aerodrome, which is planned often, we already have this information available. We have there some contracting handling agencies, so we can find them in our system. But in the case of the aerodrome, which wasn't used before, we have to spend some time to find all information."

R3: ,,… definitely not in one place. When planning a completely new aerodrome, we do not have specific information about the main facilities there. Sometimes it is hard even to find it because it is an aerodrome in the middle of nowhere like I mean in the Pacific Ocean or in Polar areas. "

R4: ,,… depending on the specific aerodrome. When the aerodrome was used in past, I have some information in the system. We are only adding a comment to this aerodrome with useful

information, what we gain previously. But when considering an aerodrome that wasn't used previously, it usually requires a long time to find all information."

R5: ,,… there is always some missing or old information, which is not updated."

Question 6: *For any required information I am using:*

R1: ,, … first I would choose Internal information then I would use a website. If still missing some info, then the AIP could be a good choice. But personal contact is usually required."

R2:,, Descending from the most preferable to the least: Internal information, websites, AIP, personal contact."

R3:,, … if I can choose more options, I would prefer the website that we are using in our company. If I will miss some information, then would try to contact authorities and companies of the specific aerodrome."

R4:,, … definitely Internal information from the company, and if the aerodrome is not on the list, I would prefer an AIP and Website of a specific country. Later, I will rely on personal contact.

R5:,, Internal information sometimes includes helpful points, but in case it is insufficient, I am using the AIP of a specific country and email or phone communication."

Question 7: *When looking for the required information, the availability of contacts is:*

A quiet clear question, but again answers were with a small comment. Two dispatchers answered straightforward insufficient, and one used only hard-to-find, but accessible. Two of them mentioned, that depending on the location of the aerodrome and its operations, they can find important information easily. But considering extended locations, these aerodromes don't have so much public information, and even airline systems don't include specific information, just general and only a few.

Question 8: *Do you have sufficient information from the publication when using the AIP of an aerodrome in extended locations?*

R1:,, Definitely No."

R2:,, It's a tough question, but imagining previous experience, I would choose No."

R3:,, These AIPs are so badly maintained. So, we have to use more options where to find information. No from me."

R4:,, As I already said, we are using usually the same aerodromes, which we already know. But from my experience with searching in AIP from aerodromes in extended locations, there is a real lack of information, or the information is not up to date."

R5:,, Would say No. Sometimes we must check or assure some contacts or aerodrome operations, but easier than losing time with searching in AIP I would rather contact aerodrome authority."

Question 9: *Do you always use the best available aerodrome on the way, or do you have to choose another due to any reason?*

Two dispatchers from the cargo company always chose the best. The reasoning for this answer was, that they are usually planning the same routes, and if there are new destinations, the network is usually sufficient to choose a suitable one.

On the other hand, dispatchers from Euro Jet answered, that not every time is possible to plan the best accessible. So, they were asked question number ten.

Question 10: *If choosing a less suitable aerodrome, what is the reason?*

R1: ,,It is due to some lack of information about the aerodrome. Some aerodromes look suitable, but if you are looking for some facilities, there is no information about that. There is even hard to find AIP for this country."

R2: ,,As I mentioned in question number two, there is no specific information about the aerodrome, which could be more suitable according to the flight path. Some military aerodromes only inform us that they can accommodate an aircraft for emergency landing, but there is no more information about facilities that can provide or guarantee ground handling."

R3: ,,For lack of information we are with my colleagues forced to avoid some aerodromes. At the very first moment, the aerodrome looks suitable, but when looking for facilities and some restrictions for operations, we can't find any published documents or anything, which can direct us to appropriate sources or contacts."

Question 11: *Which aerodromes from the available list would you choose for the planning of common flight routes? Choose at least 5 from the Pacific Ocean, 5 from the Atlantic Ocean, and 3 from Africa and the Indian Ocean*

R1:,, PLCH, PGUM PHNL, NTAA PWAK ,FHAW, GCLP, LPPD, TXKF, FHSH, VRMM, FIMP, FSIA”

R2:,, PGUM, PHNL, ANYN, NTAA, PWAK, FHAW, GVAC, EGYP, FHSH, TXKF, FIMP, FSIA, FTTJ,,

R3:,, PLCH, PHNL, PGUM, PWAK, NTAA, LPAZ, FHSH, FHAW, TXKF, LPLA, FIMP, VRMG, VRMM”

P4:,, NTAA, PHNL, PWAK, PGUM, PLCH, LPLA, FHSH, FHAW, TXKF, LPPD, VRMG, FIMP, VRMM”

P5:,, NTAA, PHNL, PWAK, PGUM, PLCH, LPPD, FHSH, FHAW, TXKF, GVAC, FIMP, VRMG, FSIA”

Question 12: *Is there some other kind of service, which is not mentioned in questions 3 and 4, and in your point of view is desired?*

From short responses is concluded, that question number three and four are all necessary aspects. On the contrary, two respondents said that they are not even considering so many aspects when collecting all information about the aerodrome.

Question 13: *As a Flight Dispatcher, would you recommend something to improve for better operations and dealing with diverted flights?*

R1: ,, That’s a tough question. For sure I would recommend to aircraft not to break down. But what would be a real advantage for us as a dispatcher is some central database of all information about international aerodromes together. This is something unreal but could help a lot.”

R2: ,, I would appreciate some agency, that will maintain some databases of all international aerodromes. Something like Jeppesen is doing for flight procedures, there could be some other company, who will provide for the extra cost this kind of service.”

R3: ,, For dispatching could be fine if there will more specific data of extended locations in the sources we are using. …”

R4: ,, Imagining a situation when a flight is diverting in the middle of the ocean, I would appreciate a page or list of all necessary information about the aerodrome, to start dealing with the situation and not waste time searching them.”

R5: ,, Well, we are used to having an internal database of destination aerodromes, where are located all names, companies with responsible persons, and their contacts in every gateway.”

6.2.4. Analyzing the data

Evaluation of interviews is conducted as the next step of the Case study. For better results in processing, the program MAXQDA 2022 was used. This program is based on the coding of words from the interviews with respondents divided into possible choices of answers. Thereafter each question is possible to evaluate separately and generate some graphical interpretation if required.

At the very beginning of the interviews, a list of aerodromes was sent to each respondent. They were instructed to go through all aerodromes and choose possible 20 aerodromes (16 from the Pacific and the Atlantic Ocean + 4 from the Indian Ocean) that they will consider suitable for flight planning. This procedure was done to save time during interviews and have the most relevant answers. The dispatchers from the cargo company were asked to consider intercontinental flights on scheduled routes, which they could possibly plan.

The first question asked about the list of aerodromes. There was a uniform answer because it is mandatory from the legislation site of ETOPS flight planning. All the respondents answered Yes.

The second question contained decision-making about military aerodromes. Three respondents answered that if the aerodrome is noted in the operation specification of the holder's certificate, they would plan a military aerodrome on the shortest route. On the other hand, two of them answered: "Depending on the situation.". When they were asked to justify such an answer, the reason was due to the availability of information about facilities on the aerodrome and worries about available equipment for handling of passengers. Both said it depends on additional information they would have during planning.

The following questions have been focused on the required Information for flight planning and desired Ground Support Equipment needed. These questions are crucial for the next direction of this thesis. Based on gained information, the Data Sheet could be evaluated and later confirmed with an analysis of aerodromes.

From the available options as an answer, all respondents uniformly chose 4 main points. It was *runway characteristics, meteorological office contact, Rescue and Fire Fighting Service, and Flight Station Service.* These answers were expected because all points are mandatory by legislation requirements. The next facilities that mentioned all of them were Fueling availability and Aerodrome Authority.

Differences between respondents were in point of other facilities. Mainly respondents from Euro Jet company who are planning passenger flights included *immigration, customs, and passenger handling companies.* Dispatchers from UPS company were interested only in handling companies, that can possibly handle the aircraft.

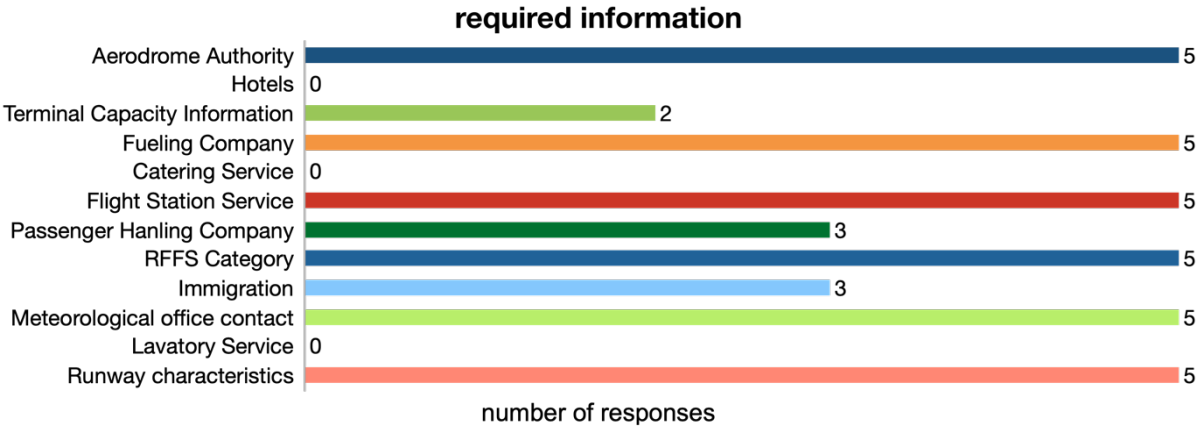


Figure 9 - Evaluated required services and facilities

From the site of Ground Support Equipment, respondents had an opportunity to choose from 10 possible answers. Not all answers were similar, but all of them chose a GSE which is necessary to park the aircraft and allow the disembarkation of crew and passengers. On the contrary, not all of them are looking for cargo/belt loaders or air starter units. In the point of a lavatory, a potable water service, and an air conditioning unit, not even one response included these aspects.

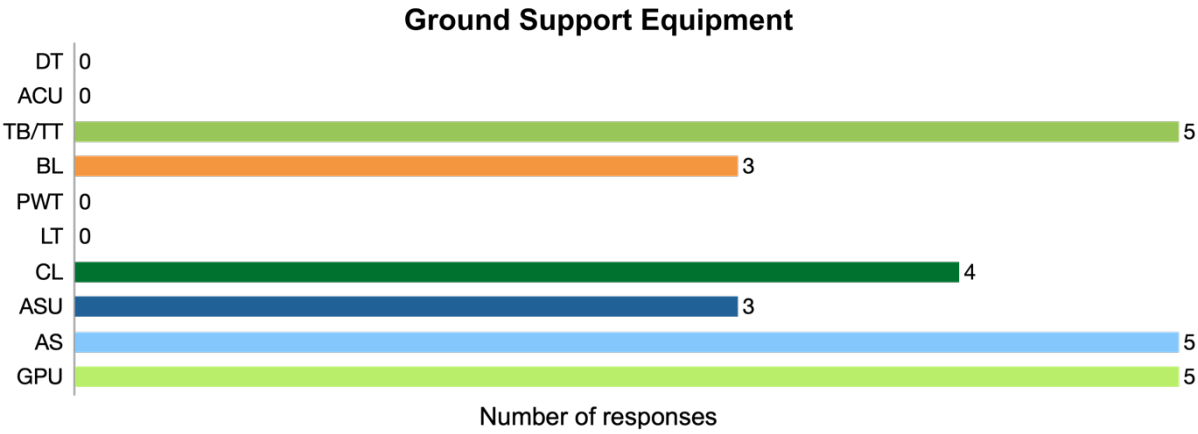


Figure 10 - Evaluated required GSE

After establishing above mentioned aspects followed questions about sources and references, where the dispatchers are looking for this information, whether they can find it easily, and their opinion about these sources.

Surprisingly four from five respondents answered straightforward *NO* to question five. Just one said Sometimes. All of them were asked to shortly explain why they chose so, or at least how many sources they are forced to use to fulfill all requirements. From the small talk, they mentioned that in the firstly planned aerodrome is hard to find this information. If the aerodrome is planned for the next time, they have some internal sources, but it is not usually enough for all information. On average they are using 3-4 sources when searching the information.

When asking the next question, dispatchers answered with a question, of whether they should choose only one possibility or more. From offered answers, they independently chose almost all of them. They were asked to at least prioritize these points, where almost all prioritize Internal sources, there was information from previous use. Three of them vote for second place for a commercial website, where a lot of useful data is placed. Rest two chose AIP as a second source. The third place belongs to personal communications, which is not always used.

One respondent answered, that if there is no specific restriction from NOTAM, they are using the aerodrome as an alternate without previously contacting the aerodrome authority, based on operational hours reported in AIP/Website.

Continuing with gained answers from the previous question, respondents were asked to evaluate the accessibility and availability of source content. As was already mentioned, two answers were without hesitation *Insufficient* and one *Hard to find, but accessible.* Rest two respondents tried to explain the situation, but from their arguments, it is not clear if the point could belong to *insufficient* or *Hard to find, but accessible*. The most important point on such answers was found out that the information is not sufficient in these sources.

Question number eight was set to answer only *Yes* or *No*. Pointing out extended locations, the clear decision from every respondent was No.

The next two questions are evaluated together. Question number nine is the possible question, which in specific answer directs the respondent to the next question. In this case, two respondents chose the *best suitable option*, so no more question is required. On the other hand, rest three chose - *another less suitable.* This decision gave them the next question to explain why. The reason for avoiding these aerodromes is based on a lack of information. Respondents mentioned missing information about any operations procedures, restrictions, or essential facilities.

At the beginning of this chapter was mentioned, all respondents got a list of aerodromes with instructions. Later they were asked to narrow their selection to only 11 aerodromes.

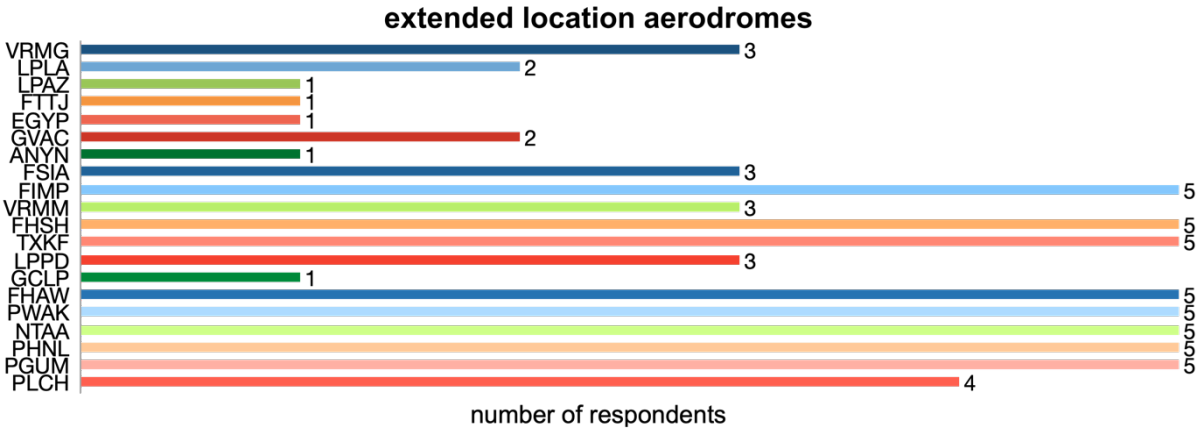


Figure 11 - Chosen aerodromes

From the graph in Figure 11 it's obvious, eight aerodromes were uniformly chosen by all respondents. One aerodrome got four points and the rest is less preferable. Hence, this selection will be base for the next step in the following part of this thesis. The analysis of aerodromes will be introduced step by step, and how information could be identified. This should be as a prove of so far gained results.

The last two questions are conceived as open to the opinion of the respondent. They were asked to identify if there is any missing area to be pointed out in questions three and four. As they mentioned, all desired points are there, and even more options, they would choose.

At the end of each interview, every respondent was asked about the improvement and evolution of this field for flight planning. From choosing codes for responses were identified three recommendations:

- List of consolidated information
- Improvement of present sources
- Central database.

6.2.5. Evaluation of interviews

Survey questions were conceived to point out the situation regarding the availability of information about extended locations, mainly in oceanic locations. The following case study focused on interviews with five dispatchers, which were analyzed with the coding of single responses.

In general, all respondents are working and planning the flight under FAA's legislation. This is the reason, why they must have aerodromes included in the operations specifications of the holder's certificate. All these aerodromes should meet specific standards according to legislation and the operator's needs.

Based on the results, if the military aerodrome is on the list of approved aerodromes, it is usually planned without significant decisions. From the subjective opinion of some dispatchers, these aerodromes have published only essential information for a safe landing, but they are missing the information which helps to coordinate the handling of the aircraft.

Considering the information that shall be utilized in case of diversion there was established from the result a set of desired fields to be maintained. The first six were agreed by all respondents, the rest three only by dispatchers planning passenger flights. Hence, mentioned points will be included in the Data Sheet of the Operational Handbook.

- Runway characteristics
- Meteorological office
- RFFS category
- Flight Station Service
- Aerodrome Authority
- Fueling Company
- Passenger handling company
- Immigration
- Terminal Capacity.

Following the research of desired aspects, specific Ground Support Equipment was identified. All respondents are always looking for equipment to park the aircraft, source of energy, and allow crew members or passengers to disembark. Later not everybody is looking for a belt loader or cargo loader, which is needed for loading and unloading baggage or cargo from aircraft. Not all respondents are also thinking about possible problems when aircraft can demand an Air Start Unit. Nevertheless, all mentioned GSEs below were included in the Data Sheet.

- Ground Power Unit
- Air Stars
- Air Starter Unit
- Belt loader
- Cargo loader
- Tow Bars/Tractors.

Above mentioned information concluded relevant aspects to be collected in the Data Sheet to be handy for dispatchers during flight planning and dealing with diversion ahead. The rest of the survey was directed at the availability of such information.

After analyzing the data was found, that desired information is not collected in one place and dispatchers are usually forced to find them out through more sources. When they were asked about these sources, all respondents were able to choose from offered options. The first, the most preferred, source is internal information. It means an already existing database of the company, which is filled from the previous usage. These databases are not usually complete and then the AIP is necessary to find out and go through them. Instead of AIP, some of the dispatchers are rather looking for information on commercial websites, which include mainly more accurate contact details for a specific person of content. The last used source is personal communication, which was mentioned by all respondents.

The general opinion about the availability and accessibility of information from the above-mentioned sources was concluded as insufficient or very hard to find. These two facts are pointing to the current state of sources that need to be upgraded for smoother and better flight operations.

The last questions only confirmed that improvement of information sources shouldn't be ignored and will be really appreciated. From the opinions of respondents will be an advantage to have some central database or list of consolidated information. This statement just confirms a requirement of the Operational Handbook, which could be maintained by a specific department of the company, some international organization, or a commercial company.

After analyzing all the data, the Operational Handbook was created and used in the next chapter of this thesis for the validation of results. Created Handbook is in annex 1 of this thesis and will be explained after analyzing selected aerodromes.

During the survey were also identified aerodromes on which will be demonstrated availability and accessibility of designated information. To selected one belong large aerodromes located in Tahiti, Mauritius, and Bermuda, but also smaller one located in Guam, Wake Island, Christmas Island, Saint Helena, or Ascension Island. After analyzing these aerodromes, one of them will be explained as a part of the Operational Handbook.

7. Analysis of Aerodromes

The partial aim of this thesis is to analyze chosen aerodromes and their AIPs to confirm the need for created Operational Handbook. All the information will be collected in one handbook and in the end, should be proven if the AIPs of these countries are maintained enough for flight planning and airline operator usage according to their needs. Additionally, if any information is missing in the AIP, a task will be to find an alternative way to gain the requested information.

One of the alternative ways to gain general information and contacts for the main person of concern (POC) of each facility and department is the website airportdata.com. This commercial website is available for access to the public, but for an extra charge ($2.500). If the airline will decide to buy this subscription, there is no guarantee of all the required information.

Additionally, some information can be taken from Jeppesen maps, which contain general section information about the aerodrome and information about local procedures. The condition for using these maps is guaranteed access from the airline. This source will be also considered and included in the handbook.

If all information is unavailable to collect from the above-mentioned sources, personal communication with specific airport authorities will be required.

Ten aerodromes were chosen according to their geographical location and the possibility to use them as an enroute alternate aerodrome.

All the points, which will be searched during the analysis of AIP, are identified in previous chapters and will be validated by Flight Dispatchers with a finished handbook. [17]

7.1. TAHITI FAA'A

The first aerodrome for analysis was chosen Tahiti FAA'A. Tahiti aerodrome is in the South Pacific Ocean at latitude 17° S. This location is for example suitable as an en-route alternate aerodrome for flights between the West coast of America and Australia or New Zealand. For imagination in Figure 12 is Tahiti marked as Papeete.

Information about the aerodrome is included in the AIP of French Polynesia, respectively PAC (ICAO Pacific region) part P, and is accessible to the public without any extra cost. The AIP PAC P is published by the French Direction Générale de l'Aviation Civile and more particularly by the Aeronautical Information Service. Section AD, Aerodrome, contains 43 international aerodromes with published information. [18]

7.1.1. AIP

In the section General, information about the aerodrome as a location, airport name with IATA and ICAO code, and information about the operator (name, address, phone number) can be found. Basically, the first section is almost identical to the request in ICAO AIP Specimen. [18]

Section Operational hours contain important information that operation is H24, which means almost all operations are nonstop and aircraft can be handled anytime. What is not mentioned in the AIP is any contact for these facilities. In the case of immigration, customs, or meteorological briefing required, a general phone or email to the aerodrome authority should be used and wait for connection with the appropriate department. This means the first delay in flight planning and increasing in the workload of flight dispatchers. [18]

From part of Ground handling and facilities is possible to have a contact for some Cargo handling agency. Focusing on an Airline operating passenger flights is required contact to the Ground handling agency providing handling of long-haul wide-body aircraft. At this point, as a Flight dispatcher, you can have a contact for a ground handling agency, but still don't know, if they are able to handle any aircraft without restriction.

Last, but not least, among the required information for the needs of airline operators is information about fueling facilities. This information is almost complete, as there are mentioned two companies, with many phone numbers and different email addresses and types of fuel available. In the next chapter, it is also mentioned the capability of hydrants and fuel trucks. [18]

In the summary of the information from AIP of Tahiti is obvious, that specific contact for each department or facility is missing and the number of Ground support equipment is also not known. This is not a huge problem until the aircraft declare an emergency and need to divert to this planned en-route alternate aerodrome.

7.1.2. Website

To collect the required information for the handbook, the website airportdata.com was used. A lot of information contained on this website match with information from the AIP. The difference is in specific contacts for the facilities and handling companies. The list of contact on the website contains at least one phone number and email for the Airport Authority (general contact), terminal passenger capacity, weather source, immigration, and customs. Additionally, from this source can be known Airport manager, Jean Michel Ratron, with available phone contact and email. [19] [20]

Nevertheless, to collect the handbook for operational needs, information about ground support equipment is still needed. From available sources, there is no such source, which can better provide this information than personal communication.

7.1.3. Personal contact

To gain the required information, a general email address to the airport authority was used. The response came from Operation-Ramp Inspector to contact the Deputy Chief of the local ground handling company, Mr. Ulric Allard. [20]

After connection with Mr. Allard via email was requested information about available ground support equipment for aircraft types used in ETOPS (B767, B777, B787, A330, A350). He was able to provide the correct number of each unit for specific aircraft. [20]

7.1.4. AKL – LAX

To demonstrate usage of aerodrome Tahiti FAA'A, a common route from Auckland, Australia, to Los Angeles in the United States of America was designed. In Figure 12 you can see that Tahiti FAA'A is an adequate alternate aerodrome for this route. The red line connecting Auckland with Los Angeles describes a Great Circle between these two aerodromes. The line below connects again Auckland with Los Angeles but is connected via Tahiti FAA'A.

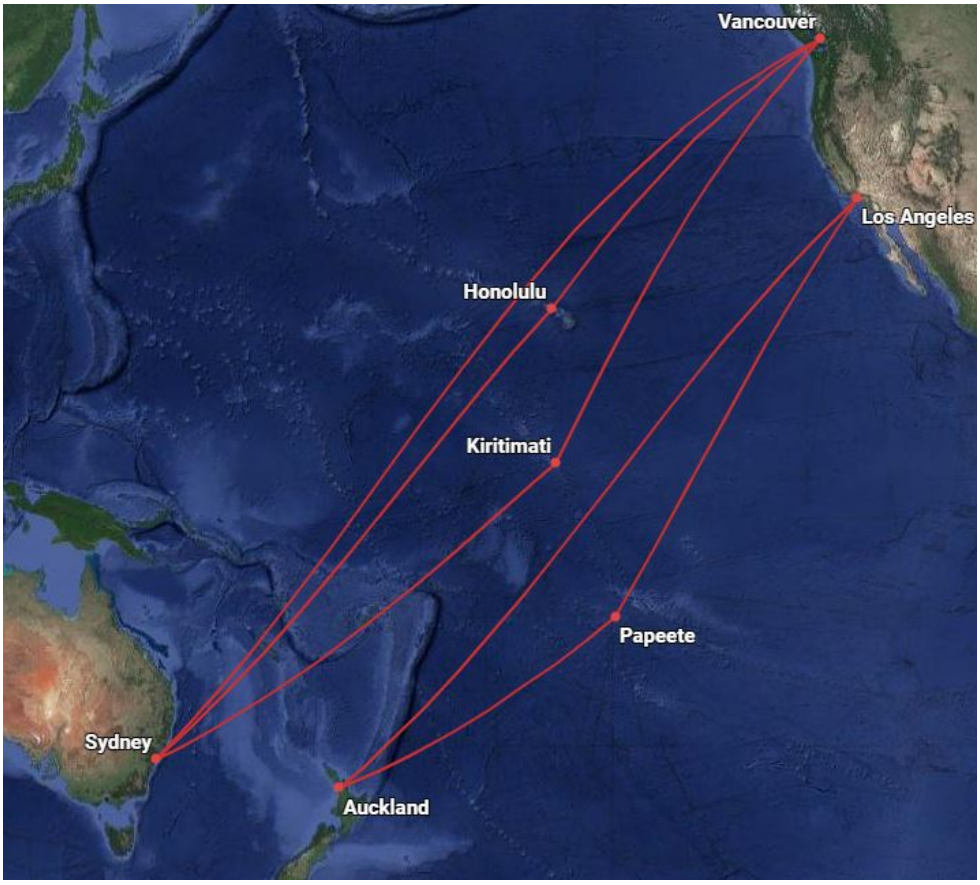


Figure 12 - Routes over the Pacific Ocean [22]

When choosing an adequate aircraft for this route, Boeing 777-319ER (B77W) was chosen in accordance with airline Air New Zealand, which is operating this type on its scheduled flight under flight number NZ6. [21]

When considering the operation of B77W an interesting point came when mentioning the Air Start Unit. As the aerodrome is normally handling wide-body aircraft, they are not equipped with Air Start Unit for Boeing 777. The potential problem is in place when this type of aircraft divers to the aerodrome and has its auxiliary power unit (APU) inoperative. In this case, the aircraft is unable to start the engines and the aircraft will stay on the ground. [20]

7.2. Port Louis Airport

Sir Seewoosagur Ramgoolam International Airport is one of the representative ETOPS en-route alternate aerodromes in the Indian Ocean. The aerodrome is located on Mauritius Island, which is known as an attractive tourist location. The aerodrome is accommodating daily dozens of wide-body aircraft and is almost nonstop in their operation. For this reason, the aerodrome was chosen for research and being part of the operational handbook. [21] [23]

7.2.1. AIP

Aeronautical Information Publication for Port Louise (FIMP) is published on the main website of Civil Aviation of Mauritius. The whole documentation is accessible free of charge to the public and contains all required subjects. [23]

The AIP of Mauritius is unlike the other AIPs divided into many documents. On the website, civil-aviation.govmu.org published AIPs Content, and each group of chapters has its own document. This could be more suitable for dispatchers or basic users to find out the required information. [23]

From the general required information is possible to find out, that FIMP aerodrome has certification 4-F with an exemption for Airbus 380, so all wide-body aircraft used in civil aviation for passenger transport are allowed to land there. [23]

In the point of hours of operation, the aerodrome is open nonstop (H24), but the administrative authority has specific hours of operation that affect customs and immigration services, which are then dependent on them. All contacts to responsible authorities are available as an email or a phone number. [23]

In a comparison of the design of the ICAO AIP Specimen, Mauritius Authority directly published the same information about Handling facilities, which are an example in Specimen (see Figures 8 and 13). They just summarized short information about GSE available, but no information about Ground handling companies is provided. In this case, no availability of contact for Ground handling or Fueling companies is published. [23]

FIMP AD 2.4 HANDLING SERVICES AND FACILITIES

(Bats) activities over the South East of the aerodrome

1.	*Cargo-handling facilities*	4 low loaders for wide-body aircraft (7 tons), 1 wide-body cargo loader (13 tons), fork lifts (5 tons), sufficient number of various vehicles and equipment handling weights up to 3 tons.
2.	*Fuel/oil types*	Jet A1, Turbo Oil 2380, ASTO 390, Skydrol 500B
3.	*Fueling facilities/capacity*	Service available 24 HR with at least 12 HR PN if operating outside 0200 - 1900 UTC Delivery rate - 3800 LPM
4.	*Ground Power Unit facilities*	Available on stands 11 to 16
5.	*De-icing facilities*	Nil
6.	*Hangar space for visiting aircraft*	Hangar space is available at Air Mauritius & at YU Lounge for General Aviation
7.	*Repair facilities for visiting aircraft*	Minor nature only
8.	*Remarks*	Nil

Figure 13 - Part of Mauritius's AIP [23]

After completing all information gained from AIP can be discussed, AIP publication is maintained according to procedures and necessary information for initial contact is published. The user can find out, that specific loading and towing Ground Support Equipment are in place.

What is missing from the required information is contact to Handling facilities and possibly contact to the main person of concern.

7.2.2. Website

Using the next mentioned sources for this thesis research, general information about the main Handling and Fueling agencies could be reached from the website airpordata.com.

From the Handling agencies, two companies with contact are published offering the availability of Business and General aviation handling, Passenger service, Cargo Airline Handling, Scheduled and Non-Scheduled Airline Handling, and Ramp Services. Air Mauritius and Ground2Air. Both companies are declaring the ability to handle Boeing 747, which is their limitation. The main difference detected from the website database is the nonstop operational hours of handling company Ground2Air in contrast with Air Mauritius, which has only on-call operations H24. [19]

7.2.3. Personal Communication

Overall, the required information was obtained from accessible sources such as country AIP and other available websites. To fulfill the requested aspects from the created handbook, an authority from Mauritius aerodrome was contacted with a question about available GSE. First, a general answer came from a representative of Air Mauritius. He just sent information that they have adequate equipment to handle all wide-body passenger aircraft. When more specific

information was required, another representative send me a list of available GSEs, displayed in Figure 14, with the numbers of each unit. [24]

AIR MAURITIUS GROUND SERVICES EQUIPMENT

EQUIPMENT	UNIT(S)
AirCon Unit	6
Baggage Tractor	13
Cobus	1
Conveyor Belt	8
Electric Tractor	15
Ground Power Unit	4
Loader	11
MEDILIFT	1
Pax Step	6
Van	6

Figure 14 - List of GSE in FIMP [24]

7.2.4. JNB – SIN

When considering a route from Johannesburg in South Africa to Singapore in Indonesia, the flight SQ479 of Singapore Airlines was chosen to demonstrate a diversion to this aerodrome. When looking at a Great Circle route (Figure 15), it is almost direct guided via Mauritius Aerodrome. The flight is operated by Airbus 350-941 (A359), which has the greatest time for ETOPS. As mentioned in the paragraphs above, Mauritius aerodrome has no limitations for aircraft, and operations of ground handling are H24 or on request. [22] [21]

Figure 15 - Location of Mauritius aerodrome according to the chosen route [22]

7.3. Cassidy International

The location of Christmas Island belongs to an interesting one in the Pacific Ocean. It is in the middle of the way from Australia to Canada, New Zealand to the USA, or Tahiti to Hawaii. However, the Cassidy International aerodrome is certified as 4C and accommodates only narrow-body aircraft. From this point of view, only an emergency landing could be performed there with large aircraft. [17]

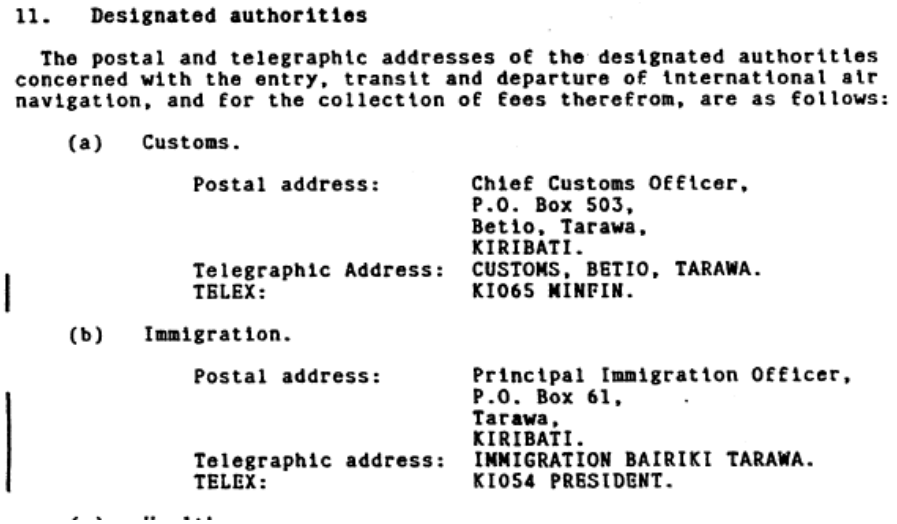
7.3.1. AIP

When searching for the AIP of Christmas Island, a EUROCONTROL website was used which directs to the website aipshop.co.nz, which is supposed to be an official source of Aeronautical Information for the Pacific region under the control of Airways Corporation of New Zealand. [25]

The latest publication posted on the web is effective from 18th May 2002. There are also two supplements, which are effective from December 2018 and February 2021, which confirms the website airshop.co.nz as an official source. [25]

The AIP is incorporating many countries which are for example Fiji, Nauru, Niue, Samoa, Tonga, and Tuvalu. The whole document has an old design, which differs a lot from previously analyzed aerodromes. Beginning from the general part, it is not selected to internationally set parts GEN, ENR, and AD. Instead, there are much more chapters with separate parts about Search and Rescue, Meteorological information, Maps, Communication, etc. [25]

Considering a contact to responsible authorities and facilitation there is published information from the year 1985, which is missing a phone number or email address. Even more, they contain telegraph addresses, which are usually unusable these days (see Figure 16).



11. Designated authorities

The postal and telegraphic addresses of the designated authorities concerned with the entry, transit and departure of international air navigation, and for the collection of fees therefrom, are as follows:

(a) Customs.

Postal address:	Chief Customs Officer, P.O. Box 503, Betio, Tarawa, KIRIBATI.
Telegraphic Address:	CUSTOMS, BETIO, TARAWA.
TELEX:	KI065 MINFIN.

(b) Immigration.

Postal address:	Principal Immigration Officer, P.O. Box 61, Tarawa, KIRIBATI.
Telegraphic address:	IMMIGRATION BAIRIKI TARAWA.
TELEX:	KI054 PRESIDENT.

Figure 16 – Contact from designated authorities on Christmas Island [25]

Focusing on the rest identified information, which is desired to know about aerodrome services, there isn't mention anything about Passenger Handling Services Fueling services, or other available facilities.

From this point of view, the information gained from AIP is only the operational hours of the aerodrome, which is only during daylight.

7.3.2. Website

When using the website airportdata.com for searching additional information, it is more usable than the AIP of Kiribati. They are listing information about the characteristic of the aerodrome, which in comparison with the Jeppesen Airport directory includes international marking 4-C. Contact with the aerodrome authority and manager is the same only one phone number. The website airportdata.com includes also email addresses for other Ground handling facilities. When looking to rest numbers and addresses, they are repeatedly using some general address for all services. It can be concluded that the aerodrome has an office which conducts almost all services. Nevertheless, there is no more information about handling emergency situations of wide-body aircraft. [19]

7.3.3. Personal Communication

To know more about the handling of large, wide-body aircraft it was decided to text an email directly to the authorities of the Kiribati Government. After redirecting to a specific person a response came from one of their representatives. [17]

In general, the Kiribati aerodrome (PLCH) is unable to serve a wide-body aircraft. There is no available GSE (not even air stairs) for handling aircraft types – B767, B777, B787, A330, and A350. They may fuel the aircraft, but there is the question of how the aircraft can move or if there are taxiways to allow this movement. [17]

As was already mentioned, Kiribati is in the middle of airways from Australia to the continent of North America. These frequent routes are used by many Airline Operators who are using always wide-body aircraft for these flights (e.g., flight AC33, NZ6 – see Figure 12). Even though Kiribati is in a strategic position for using the Great Circle track, in case of emergency the aircraft can land there, but most probably it wouldn't be able to depart. When deciding to plan the aerodrome as an en-route alternate, the dispatcher should avoid this aerodrome to be planned. [21] [26]

7.4. L. F. Wade International Airport

Location of Bermuda is on the other hand one of the representatives from the Atlantic Ocean. It is one of the larger aerodromes in an extended location, therefore can be used for flight planning as an ETOPS en-route alternate aerodrome for flights using a wide-body aircraft. [21]

7.4.1. AIP

The AIP from Bermuda is well-maintained. It does specifically contain all required information from the created Data Sheet with obligatory information until filling the contact to authorities and facilities at the aerodrome in the very beginning part of chapter 1, GEN. It includes almost all requirements in comparison with ICAO Specimen for AIP and the orientation in it is clear. When using AIP, I discovered that I don't necessarily need to use another source for contact, because almost everything is already known. Hence, I decided to directly contact the main persons of content from Ground Handling companies to know, if there are any issues to be expected when operating specific aircraft. [27]

7.4.2. Personal Communication

To know the real availability of GSE I directly contact a manager from the Ground Handling agency and gave a copy of the email to an aerodrome authority. After a few days, a got a response from the aerodrome representative, that the mentioned manager is no more working for that specific Ground Handling company. They redirected me to the general email of the company, but later nobody responded for more than two weeks, even when giving email copies to other people. At this point, it could be confusing when the dispatcher or other flight operator must deal with diversion ahead, they don't have information about available GSE, and contacts are old or not updated. With this situation, I just wanted to point out, that even if the information is published in any source, they are not up to date and need to be revised periodically. [26]

7.4.3. MAD-MEX

The Bermuda aerodrome could be used mostly for flights from West Europe to the south of North America or to the Caribbean Sea. Common flights to be pointed out are a flight of Aeromexico (AM2) from Madrid to Mexico City with Boeing 787, or a flight of British Airways (BA2157) from London to Antigua and Barbuda with Boeing 777. British Airways is operating B777 on the direct route from London to Bermuda on a daily base, so there would be probably no problem with the operation of such an aircraft. [21] [22]

Figure 17 - Routes over the northern part of the Atlantic Ocean [22]

7.5. Guam Antonio B. Won Pat International Airport

The next aerodrome from the Pacific region was chosen Guam International Aerodrome, which is in the middle west part of the Pacific Ocean. This aerodrome is suitable for flights operating on the Great Circle track from North America to Indonesia, or from Japan to Australia. The aerodrome daily handles 2-3 wide-body aircraft and up to 20 narrow-body aircraft. [21]

It is under FAA legislation and belongs to the United States territory. Hence, the aerodrome section, AD, of Guam is included in the AIP of the United State on the public website faa.gov.

7.5.1. AIP

The AIP of the United States is published on the public website and contains 37 states. All these states have designated aerodromes as regular and alternate. The Guam International (PGUM) is a regular aerodrome with daily handled 2-3 wide-body aircraft and up to 20 narrow-body aircraft. [21] [28]

Considering an organization of published information, it contains basic information about the aerodrome, runway characteristics, navigation aids, hours of operation, and aerodrome representatives. [28]

Section with Handling services and Facilities includes only information, that aerodrome has Cargo handling facilities, provides fuel of type 100LL and A1, and has available hangar space. Again, there is no information about Handling agencies providing ground service, any limitation of GSE, or capacity for operation. In the last section, general remarks are only mentioned taxi restrictions for large aircraft, specifically is mentioned Boeing 747. [28]

7.5.2. Website

When I was searching for specific contacts for each authority and facility, I used again the website airportdata.com. The general and technical sections again utilized data about the aerodrome which was already known from AIP. In the section Services, I was able to find some information about Ground Handling, fueling company, and Flight Services, but there was no information about the Meteorological office which is highly desired. This missing information I am finding out as a shortage of general information. The service will be probably provided by another office, but if looking for such information, which is mandatory for every operator from the legislation site, it should be at least mentioned, who is responsible for the meteorological report. Nevertheless, when considering the information about GSE, there is again nothing mentioned. Hence, a decided again to contact authorities from Guam aerodrome personally via email. [19]

7.5.3. Personal communication

The manager of the aerodrome, Mr. Quinata, was emailed with a request to provide more clear information about the Ground handlers and their contacts. I was redirected to another responsible person, who provide me with the information about all ground handling services and facilities, which you can see in Figure 18. With this information, I was able to continue collecting data for my Operational Handbook. When I sent emails to the specific ground handling agencies, only one answer came back. The representative from Guam Flight Service Inc. sent me information, that Guam aerodrome there can handle mentioned aircraft (B767, B777, B787, A330, A350) without any restriction. He also provided me with more contact for their ground handling company, which is displayed in Figure 19. Unfortunately, he couldn’t answer my question about the specific number of GSEs. For this reason, it should be sufficient to rely on the information they can handle mentioned aircraft without restrictions. [29]

A.B. WON PAT INTERNATIONAL AIRPORT GUAM
ATURIDAT PUETTON BATKON AIREN GUAHAN ENTENASIONAT

AIRCRAFT FUELING SERVICE ONLY

Menzies Aviation USA Inc.
P.O. Box 7418, Tamuning, Guam 96931
Phone: 642-5244/6 or 2980
Fax: 649-2096
Rodney Paet - General Manager, Guam
email address: rodney.paet@menziesaviation.com

FUEL FARM OPERATOR

Supreme Group LLC
134 West Soledad Avenue
Bank Of Hawaii Bldg., Suite 401, Hagatna, GU 96910
Phone No: 1-(671) 632-2015
Mobile: 1-(671) 489-8355
Darrel Dela Paz - Guam Manager
email address: darrel.delapaz@supreme-guam.net

GROUND HANDLERS

ACI Pacific, LLC
17-3404 Neptune Avenue, Barrigada, Guam 96913
Phone No: 1-(671) 477-0179/0163
Terry Habeck - President
email address: thabeck@flyaci.com

Guam Flight Services
P.O. Box 6738, Tamuning, Guam 96931
Phone No: 1-(671) 473-7662/3
Fax: 1-(671) 473-7661
Ray Crenshaw - General Manager
email address: rcrenshaw@guam.net

Menzies Aviation USA Inc.
P.O. Box 7418, Tamuning, Guam 96931
Phone No: 1-(671) 642-5244/6
Fax: 1-(671) 649-2096
Rodney Paet-General Manager, Guam
email address: rodney.paet@menziesaviation.com

GROUND HANDLERS - CONTINUED

Pacific Airport Services – Guam
P.O. Box 21832, Barrigada, Guam 96921
Vice President, Leon Mattern
Primary Phone: 670-285-0042
Phone: 671-647-2746
email address: leon.mattern@pasgps.com

United Airlines
P.O. Box 8778, Tamuning, Guam 93931
Phone No: 1-(671)642-8826/8595
Fax: 1-(671)477-0261/0178
Justin Marion
email address: justin.marion@united.com

OTHERS

Customs & Quarantine Agency
365 Chalan Pasaheru, Suite C-270, Tamuning, Guam 96913
Phone No: 1-(671) 642-8054 - 56
Fax: 1-(671) 649-1755
Ignacio Peredo - Director
email address: ignacio.peredo@cqa.guam.gov

Transportation Security Administration
Guam International Airport Authority
Room B-337b, 2nd Floor
355 Chalan Pasaheru, Tamuning, Guam 96913
Phone No: 1-(671) 642-7600
Fax No: 1-(671) 642-7645
Jorge Guerrero - Assistant Federal Security Director
email address: jorge.guerrero@tsa.dhs.gov

U.S. Customs & Border Protection
355 Chalan Pasaheru, Room 333, Tamuning, Guam 96913
Phone No: 1-(671) 642-7611 - 472-7349
Fax No: 1-(671) 642-7606 - 472-7491
Gerald L. Aevermann - Port Director
email address: gerald.aevermann@cbp.dhs.gov

Figure 18 - List of Guam Facilities and Services [29]

GUM/PGUM - A.B. WON PAT GUAM INTERNATIONAL AIRPORT AUTHORITY, GUAM, U.S.A.

Runway 6R/24L: 10,014 FT	Fire Category: Class1 / Index E
Runway 6L/24R: 12,015 FT	No Curfew / Airfield Open 24/7

Ground Handling	**Agent/REP:**	
Name:	Guam Flight Services Inc (GFS)	GFS Mailing Address:
Ops Office Phone:	671-473-7662/3	P.O. Box 6738
Ops Facsimile:	671-473-7661	Tamuning, Guam 96931
VHF Frequency:	130.50 mhz (Guam Ops)	
Alt Fax:	N/A	GFS Physical Address:
SITA:	N/A	770 East Sunset Bvld, Suite 257
Telex:	N/A	Tiyan Barrigada, Guam 96913

Operational Email:	groundoperations@guamflightservices.com
Administrative Email:	ray.crenshaw@guamflightservices.com
Accounting Email:	accounting@guamflightservices.com

POC:	Mary Jane (MJ) Nichols	Cellular 671-788-7847
Alt POC:	Josh Crenshaw	Cellular 671-688-3125
Alt POC:	John Pillsbury	Cellular 671-688-2778
Alt POC:	Ray Crenshaw	Cellular 671-688-3127

Fueler:	Into Plane Agent
Name:	Menzies
Main Phone:	ph: 671-642-5249 fx: 671-649-2096 (admin, open 8 to 5 Monday thru Friday)
Product:	Jet-A1
Density:	6.55

GUM Airport Info:	671-642-4450 (admin)
GUM Ramp Control:	671-642-4455/56
Guam Center/ATC:	671-473-1210
Flight Plans:	groundoperations@guamflightservices.com
Flight Plan Filing:	PGUMZQZX PGZUZRZX PGZUZQZX KZAQZQZX KZCEZQZX KZAKZQZX

ARFF: TEL: 671-475-5151 Facsmile: 671-647-2678

US Navy Hospital	TEL: 671-344-9232	Distance 3.0 miles
Guam Memorial Hospital	TEL: 671-647-2330	Distance 2.5 miles
Guam Regional Medical Center	TEL: 671-645-5500	Distance 3.0 miles

Nearest FedEx Security NRT/JP TEL: 011-814-763-3405

Guam Customs/Agriculture:	671-642-8071/72 Facsmile: 671-649-1755
USCBP Immigartions:	TEL: 671-642-7611 Facsmile: 671-642-7606

Lufthansa LSG Sky Chefs (only airline caterer on Guam) TEL: 671-5868/69 Disp Facsmile: 671-646-6798

Special Information for this Location:

1. Flight Plans should be sent to groundoperations@guamflightservices.com three hours prior to arrival.
   Send Notams/Tafs/Metars to groundoperations@guamflightservices.com
   GFS can provide graphic weather charts.
2. Parking will be determined day of arrival.
3. PPR numbers are not required at PGUM.
   PGUM is a US Public Airfield. N-registered aircraft are required by FAA to have a LPA filed for a tech stop.
4. GUM airfield frequency list:

Agana Tower -	118.10 mhz	GFS Operations -	130.50 mhz
Agana Ground -	121.90 mhz	Ramp Control -	121.60 mhz

5. Airfield peak ramp hours are between 0200z to 0800z and 1400z to 2000z daily.
6. Standard ground support equipment is available: Tractor, Towbars. GPU, ACU, ASU, FMC Loaders, Lavatory/Water Service, Passenger Stairs, Tugs/Dollies, Various Forklifts.
7. See attached CIQ requirements for Guam Customs/Agriculture and USCBP Immigrations.

Figure 19 - Summary of contact for Ground Handling in Guam [29]

7.6. Saint Helena Airport

The next aerodrome from the Atlantic Ocean is from its southern part. Saint Helena Airport belongs to the overseas territory of the United Kingdom and belongs to aerodromes, which are not so common for scheduled operations. All operators, who want to use the aerodrome, need to obtain prior permission from the Chief Executive Officer. [30] [31]

7.6.1. AIP

The information publication of Saint Helen could be found on the Saint Helena Government website and is publicly available. The organization of documents is according to requirements from ICAO and its Specimen for AIP. [31]

When looking for basic contacts, all required authorities are published in section GEN 1.1 – Designated authorities. From this source, I could fill in general information on the Datasheet. It can be said, that as a small aerodrome it wouldn't have many ground operators and the presented contact as Airport Operations will be for ground handling operations. If so, the AIP of Saint Helen has known almost all basic information and at least one contact of each facility. [31]

The rest required information should be again taken from another source

7.6.2. Website

When I used again the website airportdata.com, there was nothing more as compared with AIP. Even more, there was no information in the section Services, so for this aerodrome, the website is almost useless. [19]

When going through the original website of Saint Helena Airport, there could be known some more information about Airport Authority representatives and their contact. [30]

7.6.3. Personal Communication

As usual, I tried to establish contact with the authorities of the aerodrome. I wrote an email to published addresses with a request for information for ETOPS flight planning. Even though the aerodrome is limited to specific aircraft, specifically A319 and B757, I sent an email [31]. Unfortunately, there was no answer even after one month and the next appointment.

7.6.4. Africa-South America

I didn't use any specific fight routes for this location because as the aerodrome is not suitable for wide-body aircraft, it can be only used on this route by narrow-body aircraft certified for ETOPS flights. Nevertheless, I wanted to point out, that on this route there are no more aerodromes, which could be possibly planned because this area is flooded by water. From this

point, it is really desired to have all contacts up to date in case any aircraft that travels such a distance wants to use this aerodrome for emergency reasons. [21]

7.7. Wake Island Airfield and Wideawake

At the end of the analysis, I will describe these two aerodromes, which are unlike others military. These aerodromes are both published as available for ETOPS planning. [32] [33]

The Wake Island Airfield is in the Pacific Ocean and is under the control of the US Air Force. The FAA publishes this aerodrome on its website as available for ETOPS planning, where are also information for operations. [32]

The Wideawake aerodrome belongs to the Saint Helena government and is used by Royal Air Force and US Air Force. On the general website of Saint Helena Airport (previously analyzed) is published a link for the general website of Ascension Island. This link directs to a website ascension.gov.ac where is written information, that this aerodrome could be used as an ETOPS en-route alternate. [33] [30]

7.7.1. AIP

When searching for AIPs of country or aerodrome, they were not available. The Aeronautical Information of Wake Island Airfield is supposed to be included in the US AIP, the same as Guam International because the Aerodrome belongs to the US territory.

The Wideawake is under the government of Saint Helena and might be included as the second part of section AD, after/before the Saint Helena Airport.

7.7.2. Website

Using the website for more specific contacts, I didn't expect more information than I gained from previous sources. On the contrary, the website includes helpful parameters, at least in the technical section. From this section, I was able to know all the required information about runway characteristics, basic contact for the aerodrome authority and its manager, the RFFS category, and contact for Flight Station and Meteorological office. [19] [34]

Trying to know more about any facilities on the aerodrome, there was no more information about their availability.

7.7.3. Personal communication

Previous sources gave only essential information desired from the legislation. In point of information about facilities and services, I emailed posted contacts to reach some more information, on how the aircraft will be handled in case of an emergency landing.

No answer came from Wake Island Airfield. I used a general email published in every source I found, but the was any response.

The communication with the Wideawake was established, however, I got only a response, that aerodrome is undergoing a reconstruction of the runway, so no operations are available. I try to gain some other information that could be helpful in future operations, but I didn't get any other response from them. [34]

To point out the position of Ascension and Wake Island, both are with their runway length good alternatives for wide-body aircraft. Looking at Figure 20 there are displayed commonly scheduled flights, which could use aerodromes as an ETOPS en-route alternate. These flights are e.g., Ethiopian ET3505 from Accra to Sao Paolo, Qatar Airways QR773 from Doha to Sao Paolo, or LATAM LA8114 which operates from Sao Paolo to Barcelona. [21]

Figure 20 - Routes over the southern part of the Atlantic Ocean [22]

7.8. Evaluation of analysis

The aim of analyzing the aerodromes was to show the availability and accessibility of desired information about identified aspects. I also tried to identify commonly scheduled flights that could use these aerodromes as en-route alternates and identify any limitations for these flights.

7.8.1. AIP

The first analyzed aerodromes (Tahiti, Mauritius, Bermuda, Guam) were good examples of alternate aerodromes in extended locations. All these aerodromes are handling wide-body aircraft on a daily base and the information about all services and facilities is well maintained. Considering the AIP of these countries, the publications are maintained according to ICAO requirements and seem to contain all mandatory information.

On the other hand, the next chosen aerodromes (Kiribati, Saint Helena) belong to the category of aerodromes, which don't operate a wide-body aircraft and have only a few movements per day. The AIP from Saint Helena can be considered as well utilized because its design is almost the same as ICAO Specimen and contains basic information. On the contrary, the AIP of Kiribati is not even updated, as was mentioned in the analysis. It contains old information, and its organization is chaotic in comparison with other analyzed countries.

The last two military aerodromes didn't even offer Aeronautical Information about their location. The AIP is probably not available to the public.

7.8.2. Website

The website source I used always after I went through the AIP of the country. I usually used the website airportdata.com because I was allowed to use this source for purpose of my thesis. The other used websites to search for the information were official websites of the aerodrome, or websites from the government.

Generally, the website airportdata.com seems to be based on collecting information from AIP and doing a step forward, which means contacting general email addresses and knowing specific contact to each service and its responsible person. The availability of information was almost the same as was in AIP. Aerodromes that are used frequently and with more operations had more information in comparison with the rest, which operates only a few flights in more extended locations. Using this website for military aerodromes there was more information compared with the official website of aerodromes.

7.8.3. Personal communication

I tried to contact each aerodrome authority separately, to gain as much information as needed to fill out the Datasheet of the Operational Handbook.

As was mentioned in the description of each aerodrome, some locations were answering within a few hours, but some of them didn't answer at all. From the available communication, I was able to fill out the required number of GSE and identify a possible limitation for the specific aerodrome.

7.8.4. Overview of locations

Figure 21 displays flight routes, which can possibly use analyzed aerodromes for ETOPS en-route alternate.

Figure 21 - Overview of identified routes [22]

The aerodromes on Tahiti, Mauritius, Guam, and Bermuda could be planned almost without restrictions if the aircraft meets all requirement for ETOPS operations and have no limitations for basic operations. Aerodromes would be able to handle these aircraft with standard procedures and no significant problems or delays could be expected. If the aircraft after landing will be grounded, these aerodromes can accommodate passengers and allow disembarkation or provide a change of the aircraft.

In case of an emergency landing in Kiribati, the Runway length could be sufficient for landing, but the problem comes after the aircraft stops. As the aerodrome is certified only as 4-C, they don't have any GSE for handling wide-body aircraft. The aircraft can continue taxiing by itself, but not even air stairs for the disembarkation of passengers are available. Hence, this aerodrome should be avoided in the planning of ETOPS alternate aerodrome for wide-body aircraft. Alternative for this aerodrome could be Tahiti or Honolulu which are both about 2300 km far away from Kiribati.

Saint Helena Airport is only one aerodrome from all which landing distance available is less than 2000 meters. From this point of view, this aerodrome is not available for usage as an alternate aerodrome for wide-body aircraft. In case, a narrow body uses this aerodrome, the aerodrome is strictly prior to previous permission from the aerodrome authority and the aerodrome could be used only during the daytime. In my opinion, it is hard to say how long it will take to get in touch with somebody from the aerodrome authority because when I tried it, there was no response at all. Even though the aerodrome is in a good location to be used for ETOPS planning, it is unusable for wide-body aircraft.

The military aerodromes partly confirmed a previous theory about the accessibility and availability of information. The information about Wake Island Airfield can be found on the FAA website under the topic of ETOPS alternate aerodromes. There are published obligatory information for flight planning and safe landing. From this point the accessibility of information is satisfied. But when looking for some other information about facilities, there are no more links, publications, or sources where to take them. When trying to establish communication with the aerodrome, again nobody answered the email.

Considering a Wideawake, the aerodrome confirmed completely a theory of accessible information. The aerodrome doesn't publish any specific information about its airfield, the only information I found on the commercial website is an unofficial source, and the next action is required to confirm the accuracy. It is necessary to point out, that communication was established but as the runway is currently under reconstruction, they are not available for planning of ETOPS.

7.8.5. Summary

In the summary, the analysis of aerodromes confirmed the problem of information utilization in extended locations. Aeronautical Information Publication was in five of eight cases utilized well, but the rest three were insufficient or unavailable. Well-utilized means it is meeting international requirements according to the published ICAO AIP Specimen and contains desired information, which is helpful for flight planning and is identified in interviews with dispatchers.

Other information required for flight and ground operations was mostly sufficient again for bigger aerodromes in comparison with the smaller or military ones. Used websites can be considered confidential, but it sometimes contains old information which is not updated.

When comparing information gained from email correspondence with representatives of aerodromes and on the website/AIP, there were minor differences in contacts and published

names. All other information is appreciated because this information isn't available in any source, which was used during analysis and which could be now used by dispatchers.

8. Manual

This manual is directed to dispatchers planning ETOPS flights with alternate aerodromes in extended locations. The handbook should decrease workload, increase the effectiveness of planning, and help deal with contingency situations caused by disruption and divert of a flight.

As was found out in research, the availability and accessibility of information for aerodromes in extended locations are insufficient. To collect all desired information, it is necessary to use specific sources, which can provide all required contacts and information about the aerodrome.

8.1. Decision for aerodrome

Before planning an aerodrome as an ETOPS en-route alternate, the dispatcher must assure itself of meeting all legislation requirements for ETOPS flight planning. Depending on under which authority is flight planned, this aerodrome should be included in the operation specification of the holder's certificate.

The aerodrome is usually on the Great Circle route of flight path and must be within the time limit for specific aircraft, see chapter 2 of this paper – ETOPS.

8.2. Sources of information

Desired information identified after conducting interviews and analyzing results is usually in more than two places.

The required aspects from point of legislation are described in Chapter 2 of this document - ETOPS. These requirements are summarized in the first part of the List of aspects, which would have the dispatcher handy during flight planning, see Figure 22.

All this information is usually available from the internationally used Jeppesen application, AIPs of the country (if available), and websites (e.g., airportdata.com).

ETOPS ALTERNATE AIRPORT DATA SHEET	
Airport Name:	
Airport Location:	
IATA Code:	
ICAO Code:	
Airport Information	
Aircraft Types:	
Runway length(m):	
Runway PCN:	
Tower frequency(MHz)	
RFFS ICAO Category	

Figure 22 - Datasheet part one

After identifying basic aspects for commencing a safe approach and landing, contact for the main Aerodrome Authorities and Facilities named in Figure 23 should be established.

Requirements of these authorities/facilities were identified from the Airline operations requirements described in chapter four of this thesis and confirmed with dispatchers during interviews.

Airport Main POC					
	Name	**Hours**	**Phone**	**Cell**	**Email**
Airport Authority					
Airport Manager					
Terminal - Passenger Capacity					
Flight Service Station					
Weather Source					
Immigration					
Customs					

Figure 23 - Datasheet part two

These contacts are usually available on the website of the specific aerodrome, but mainly for dispatch planning again commercial websites such as airportdata.com are recommended to be used. These data are sometimes unavailable on this web too, so the dispatcher after realizing the lack of data on this website should go through AIP and try to find out more specific information.

Continuing with AIP after reviewing commercial websites is due to the chaotic arrangement of AIP and the presence of all information from AIP already on this website in a better-consolidated way.

In case of the unavailability of any data, personal contact needs to be established. To find at least contact for any Authority, the website of EUROCONTROL offers the section *Articles*

where located list of countries around the World with general contact to authorities responsible for Aeronautical Information Services.

When general facilities are fixed, Ground handling and Fueling companies should be identified and contact known. Some aerodromes have more than one Ground handling or Fueling company, so for better cooperation and backup plans, it is an advantage to have all information available. This is part three of the Datasheet, which is displayed in Figure 24.

Fueling Company					
	Name	Hours	Phone	Cell	Email
Company					
Main POC					
Fuel Type		Notes:			
Into Plane Method (Truck/Hydrant)					
Fuel Storage Capacity(cubic meter					
Ground Handling Company					
	Name	Hours	Phone	Cell	Email
Company					
Main POC					
Secondary POC					

Figure 24 - Datasheet part three

Last but not least, during interviews were identified items from Ground Support Equipment, which should be also included in the List of information about the aerodrome.

Ground Support Equipment		
	# of Units	Aircraft Type(s)
Jetway		
Air Stairs		
Air Start		
GPU		
Container Loader		
Belt Loader		
De-icing Truck Information		
Tow bars(if required)		
Tow bars(if required)		
Tow bars(if required)		
Tow bars(if required)		

Figure 25 - Datasheet part four

Figure 25 names all GSEs, which are essential for handling the aircraft at a very basic level. The problematic part comes when looking for information about the availability of each piece of equipment for specific aircraft. Previously gained contact for the Ground handling agency shall be used and all necessary points to be asked.

At the end of the List is a special field for additional notes, where should be mentioned any limitations of the aerodrome for specific aircraft or operations. This field should be maintained up to date, and dispatchers are required to warn a crew about limitations.

8.3. Example

To demonstrate the use of the manual on specific aerodrome you can see collected information on Tahiti FAA'A.

Tahiti FAA'A aerodrome isn't directly on the Great Circle route of common flights over the Pacific Ocean but meets the criteria to be within range for wide-body aircraft (B777, B787, A330, A350).

For identifying the criteria from the first part of the data sheet, the Jeppesen was used. Nevertheless, to know the rest required information AIP had to be used. All the data from the Jeppesen application displayed in Figure 26 are marked with yellow color. The green color represents data gained from AIP of Tahiti.

ETOPS ALTERNATE AIRPORT DATA SHEET	
Airport Name:	TAHITI FAA'A
Airport Location:	17°33'24"S 149°36'41"W
IATA Code:	PPT
ICAO Code:	NTAA
Airport Information	
Aircraft Types:	
Runway length(m):	RWY 04 = LDA 2935; RWY 22 = LDA 3185
Runway PCN:	57 F/B/W/T
Tower frequency(MHz)	TAHITI Tower 118.100
RFFS ICAO Category	CAT 9

Figure 26 - Datasheet of NTAA, part one

Going through the AIP of Tahiti, much useful information is present and could be added to a data sheet. In point of the Fueling facility, there is nearly all the information required. On the contrary, when looking for Ground handling companies there is barely mentioned the name. At this point, the website airportdata.com was used to find out other information. Figure 27 displays again available information divided into two colors. Green fields represent information from AIP, orange fields represent information from the mentioned website.

Airport Main POC				
	Name	**Hours**	**Phone**	**Email**
Airport Authority	AEROPORT DE TAHITI	H24	+689 4086 6130	pce@tahiti-aeroport.pf
Airport Manager	Jean Michel Ratron	N/A	+689 4086 6060	adt@tahiti-aeroport.pf
Terminal - Passenger Capacity	AEROPORT DE TAHITI	n/o	n/o	CDQ@tahiti-aeroport.pf
Flight Service Station		H24	+689 4086 1150/51	
Weather Source	OfficeTAHITI FAA'A NTAA	H24	+689 4080 3334	dirpf-previ-pp@meteo.fr
Immigration		H24	n/o	
Customs		H24	+689 4086 6003	faaa-bse-cdu@douane.finances.gouv.fr

Figure 27 - Datasheet of NTAA, part two

Fueling Company					
	Name	Hours	Phone	Cell	Email
Company	SOMSTAT BP	OR	+689 4080 3236	+689 785057	operations.somstat@mail.pf
Main POC	n/o	n/o	+689 8931 4335 +689 8931 4334	direx-somstat@mail.pf	
Fuel Type	Jet A-1	Notes:			
Into Plane Method (Truck/Hydrant)	YES				
Fuel Storage Capacity(cubic meter	16000 liters				

Ground Handling Company					
	Name	Hours	Phone	Cell	Email
Company	ExpandAIR TAHITI - COMMERCIAL	H24	+689 4086 4211	+689 8772 1819	ops.ei@airtahiti.pf
Main POC	Ulric Allard	N/A	+689 4086 4209	N/A	ulric.allard@airtahiti.pf
Secondary POC	n/o	n/o	n/o		

Figure 28 - Datasheet of NTAA, part three

The last part of the Aerodrome data sheet covers a list of required GSE. These data were obtained from personal contact with FAA'A aerodrome authority and the chief of ground handling. He provides me with information about the number of each piece of GSE for wide-body aircraft.

Ground Support Equipment		
	# of Units	Aircraft Type(s)
Jetway	4	all
Air Stairs	8	all
Air Start	1	B767, A330, A350
GPU TLD 28V/115V-400Hz	2	all
Container Loader	5	all
Belt Loader	4	all
De-icing Truck Information	N/A	N/A
Tow bars(if required)	1	B777
Tow bars(if required)	1	B767
Tow bars(if required)	1	A330
Tow bars(if required)	1	A350
Tow tractor (TMX450)	2	all

Figure 29 - Datasheet of NTAA, part four

In the end, any limitations for the planning of common aircraft and operations were considered for this route. Tahiti FAA'A doesn't have such limitations, but when planning a Boeing 777 on the route, it should be considered that the aerodrome is not equipped with Air Starter for this type of aircraft. Hence, the Minimum Equipment List (MEL) should be reviewed before choosing this aerodrome for diversion.

NOTES: Air Starter not available for B777!

Figure 30 - Datasheet of NTAA, notes

Discussion

Already during guided interviews, the attention was focused on the opinion of each respondent to extended diversion locations. It helped understand this topic more deeply and evaluate the results.

Results from interviews show that the correct aspects for handling the aircraft in the diversion location were identified. However, during the research were identified almost all actions that must be done during the common turnaround of the aircraft and are not required for emergency or non-standard operations. Respondents confirmed the basic items, which are required in case of a diversion situation or at least are desired the most.

In the part about the facilities and services were also selected only essential services. In point of the chosen options was the difference between the dispatchers of passenger and cargo flights. Obviously, the dispatchers of cargo flights do not require a service for passengers. Nevertheless, all the dispatchers are following the international requirements by legislation and chose all desired facilities and services, which are set by the legislation of FAA/EASA.

One of the most interesting parts was found the present state of information about aerodromes in extended locations. All the dispatchers had to answer a few questions directed straight at this problem. The results showed that dispatchers are missing enough information about facilities and some services. The information always presented is only runway characteristics and a general aerodrome authority contact. In some locations, there is missing information about the meteorologic office, or specific flight service contact which are mandatory for flight planning of these aerodromes as an ETOPS en-route alternate.

At the end of the interviews, dispatchers were asked what they will appreciate as an innovation or improvement in flight planning. The most common results are pointing out some consolidation of information about each location.

From the interviews, were evaluated the results and created a Datasheet. This Datasheet was used in the Analysis of the aerodrome, where were demonstrate and confirmed the results from interviews. The purpose of the analysis was to find all desired information identified in the Datasheet and point out the accessibility and availability of chosen aerodromes.

During the analysis, it was sometimes hard to find out relevant sources for data about the aerodrome. In some locations, it was almost impossible to find some information, even though many sources were used.

A challenging point in the analysis came with military aerodromes because the information about them couldn’t be found. Only basic information was found in the common sources, but the rest are presented in the many sources on the internet, which are mistrustful.

At the end of the analysis, all gained information was consolidated into one document, which includes all analyzed aerodromes and will be used as the Handbook for dispatchers during planning the ETOPS en-route alternate aerodromes and can be used in case of necessary dealing with diversion situations.

As the Handbook contains only a few chosen aerodromes, there is also a Manual on how to continue with adding new required aerodromes and how to find out the information.

Conclusion

The main goal of this thesis was to analyze the problematics of the EDTO diversion locations planning, to analyze the global diversion locations that are most problematic, and to list the legislative and practical operational requirements. As such a proposal of the handbook summarizing the above with the data structure covering the most needed data items, with a practical example of data from several airports has been produced.

The aforementioned research has been done from the perspective of the international operators of ETOPS aircraft flying commercial passenger services over extended routes, requiring the usage of locations that are not well documented.

The most significant practical benefit of this thesis is a summary of data items that are required for flight planning of ETOPS flights in extended locations and are desired by legislative and airline dispatchers needs. These data items have been validated during guided interviews with five airline dispatchers, who are planning and overseeing ETOPS flights.

The limitation of the handbook completion was, as demonstrated lack of responsiveness from the airport authorities and airport stakeholders on the diversion locations, that only further confirms the necessity of regular and authoritatively driven data collection and revalidation, which could be a significant benefit of the aircraft operators, should they be forced to divert an aircraft to one of these aerodromes. Due to this only eight aerodromes were researched for the development of the Operational Handbook, which consolidates all gained information from known sources and personal communication with aerodrome authorities even though not all information was achieved

Given the situation that the topic of remote diversion sites is not very widespread, this guide is an example of a possible improvement in this situation. In the future, it could serve better and more reliable aerodrome planning in these locations. This manual can also serve as a proposal for a central database that would be maintained by local authorities and thus could be certified by FAA or EASA. Last but not least, this is an intensification of the problem at aerodromes, which, due to their strategic location, may be of interest to several airline operators, who could, in their interest, contribute to the financing of the innovation and its facilities, so that they can use it on their routes without any problems.

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