

What is the role of AAIB reports, and particularly the influence of judgmental language in them, in how the Swiss judicial system determines individual culpability of ATM operators?

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ABSTRACT

This report presents the results of a single case study conducted within an Air Navigation Service Provider (ANSP) organization as well as on the interface between an Aircraft Accident Investigation Bureau (AAIB) safety investigation and a subsequent judicial investigation. It explores the role of AAIB reports and especially the judgmental language in these when the judicial system opens investigations to determine culpability. Further it attempts to verify whether an account of a safety investigation, which emphasizes explanations of performance instead of normative judgments as proposed by Dekker (2006) could contribute to a reduction of what the aeronautical industry amongst others sees as “criminalization of human error” with consequential negative effects on the perceived justness of the system and operators willingness to report adverse events. The study demonstrates how an AAIB report in Switzerland, with its strong freedom of information act, often serves as primary source of information in the judicial system in cases of incidents and that its account has an ontological status in a criminal investigation. Further it demonstrates how judgmental statements can translate directly into suspicion of negligence. Finally an alternative account produced for this case study indicates that a safety investigation, which exchanges indignation with explanation, could help to reduce the suspicion of culpability from the public prosecution perspective and hence satisfy the demands for progress on safety and accountability simultaneously. Since the structural arrangements on admission of safety data into judicial investigations are difficult to change, this finding is important for the assurance of a continuous free flow of occurrence information by the concerned operators.

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THESIS DEVELOPMENT

Introduction:

The literature review:

The Literature review explored connections between language, text, their interpretation and the creation of meaning in individuals or larger groups of people and how all of these aspects are influenced by the “ruling paradigm” of the involved subjects. These paradigms, worldviews or ontological positions can be encountered explicitly, as this often is the case in scientific discourse, or implicitly in situations of everyday professional and private life. The review concluded that there probably is a relationship between the judgmental and normative language, with its focus on human error and failure as often encountered it in Swiss AAIB reports on accidents and severe incidents, and the resulting criminalization of the apparent human contribution. While the literature review built this hypothesis on the analysis of historical perspectives, linguistics, hermeneutics and recent research on the connection between language and thought, it could not substantiate whether these mechanisms are actually at play when judicial systems choose to prosecute in the aftermath of accidents and incidents. Too hidden were the processes, interactions and assessments that preceded such actions. What became apparent was however that so far, at least in Switzerland, such proceedings had almost exclusively been initiated on the basis of published AAIB reports and that the reports, which had lead to subsequent judicial proceedings, explicitly linked severe outcomes to judgments about human failure.

The thesis question:

The creation of the literature review eventually guided towards the formulation of the thesis question:

"What is the role of AAIB reports, and particularly the influence of judgmental language in them, in how the Swiss judicial system determines individual culpability of ATM operators?"

Hypothesis:

Narrowing in on the terms connected with "Human Error", a societal tendency for labeling and the possible influence of Calvinist Ethics led to the development of the hypothesis that the language used in current AAIB reports, which contained normative and judgmental statements and causal connections between human error or failure and the investigated incident or accident, played an aggravating role in leading to judicial proceedings against the involved operators, in particular air traffic controllers.

Identifying the unit of analysis:

According to Creswell (2007) "in a case study, a specific case is examined, often with the intent of examining an issue with the case illustrating the complexity of the issue" (p 93).

Following numerous considerations on leverage to answer the thesis question, available cases to study, and assurance that judicial proceedings had come to a closure it was decided to focus on a runway incursion/go around incident between (Lufthansa) DLH3703 and (KLM) KLM1931, which occurred the 26. Of April 2004 at the airport of Geneva, as a single case study. The magnitude of data to be processed in order to present the case and the level of preparation that could reasonably be demanded from any interviewees indicated the appropriateness of choosing a single case for the scope of this thesis. The chosen case had several qualities that made it an

interesting object of study. First, it was not an accident but an incident, which was voluntarily reported by the concerned controller. Accidents can create reactions to failure that lead to indictment by the simple fact that someone was hurt and consequently a personal or societal need to hold someone accountable emerges. Furthermore accidents are not contingent on internal reporting (formally they remain reportable events), since they become known internally as well as publicly almost instantaneously as a consequence of very visible adverse outcomes. Also the language used in the proposed case was not amongst the harshest to be encountered in Swiss AAIB reports, when it comes to creating a judgmental account about individual failure. It could be described as being relatively subtle in this respect compared to other potential subjects of study. Nevertheless the report eventually lead to judicial proceedings, which made the elaboration on the how and why and the potential role of language even more interesting and relevant. This event, in which nobody was harmed, was investigated by the Swiss AAIB, who released a report in May 2005. Based on the information in this report the judge of instruction in the Canton of Geneva in early 2008 accused the involved tower air traffic controller (TWR ATCO) of endangering public traffic. While it took 18 months, the accusation was first reduced to disturbance of public traffic and eventually dropped completely in October 2009. Despite the eventual dismissal from charges the collateral damage has been substantial both on the personal level for the concerned controller and on an organizational level with regards to reporting of incidents. Apart from the closure of the judicial proceedings, it was also necessary to have the consent of the concerned controller prior to the research interference with what also constituted a very personal and unpleasant experience.

The limited scope would of course also limit the conclusions and generalizations that could be derived from it. The study, if it could somehow achieve a validation of the hypothesis, nevertheless had potential of becoming a signpost pointing towards an object worthy of further study.

Method:

Case study as research type:

The research was conducted in the form of an instrumental case study. “This is a type of study with the focus on a specific issue rather than on the case itself. The case then becomes a vehicle to better understand the issue.” (Creswell 2007, p. 245). A runway-incursion, go-around incident, which occurred at the airport of Geneva on April 26 2004, was chosen to serve as the “vehicle” case. The issue the research concentrated on was the response of the judicial system that took place subsequent to the release of the AAIB’s investigation report and what influence the language used in the report may have played in the decision to open judicial proceedings.

Unit of analysis:

The case of DLH3703/KLM1931 was deemed appropriate for this research for several reasons. From an ethical perspective the judicial proceedings had to be terminated at the time of the research in order not to inadvertently creating negative judicial consequences for involved operators through the research process. From a research perspective the case was interesting since it concerned an incident that was voluntarily reported by the involved ATCO and in which no one was hurt. Reactions to failure, including judicial ones, that might occur in the aftermath of an accident, where people got hurt or killed, could hence be ruled out as rationale for assessing culpability. Further the language used in the AAIB report, while carrying normative and judgmental statements, could be described as rather subtle compared to several other AAIB reports released during the last decade.

Nevertheless, the report still ended up creating the basis for subsequent judicial proceedings. Hence the case created a good foundation for investigating the processes through which AAIB

reports are becoming instruments in assessing culpability and whether these assessments are influenced by the encounter with judgmental language in these reports.

Preparing the research:

The interviewees for this research needed to be found within the judicial system, ideally with representatives from the prosecution and the defense side as well as from the legal department of Federal Office of Civil Aviation (FOCA). This institution plays a central role in the initial assessments regarding possible culpable acts.

The research was organized in the form of semi-structured interviews with approximately 2 hours duration. The questions, which can be found in Annex C concentrated on two main themes. First a more general understanding was sought with regards to applied processes for the introduction of the concerned AAIB report into the judicial system, what legal framework would apply and how the content was coded or interpreted in order to derive information on culpability. Second, central parts of the analysis section of the AAIB report, which contain normative or judgmental language, would be discussed for their influence on the judicial assessments.

Here the interviewees would also be asked for their perception regarding an alternative investigation account, produced for this research, in which the focus was to give an account from “inside the tunnel”, explain performance instead of judging it and “look further into the organization” as proposed by Dekker (2006).

Creswell (2007) proposes that a case study presents the concerned case extensively in its context “with a body of relatively uncontested data” (p197). The case on this level consisted of two parts that needed to be described. First there was the description of the incident itself. Second, a short

description of the post incident events, starting from the filing of an Operational Internal Report (OIR) via the initiation of the AAIB investigation and the release of an investigation report to the opening of the judicial proceedings and the eventual closure of the case needed to be established in order to help answering the question on the role of the AAIB report. Further it was necessary to provide a critical review of the analysis of the AAIB report in order to demonstrate where the account could be problematic from a safety and human factors perspective as well as to identify passages with normative or judgmental language where the question of culpability could emerge. Finally, in an attempt to fortify the thesis hypothesis through a comparison with an alternative account that systematically sought to explain performance, a re-investigation of the occurrence had to be conducted and documented. Since the eventual indictment only concerned the controller and this also was the only available source of first hand information, the scope of the re-investigation was limited to the Air Traffic Management (ATM) domain. Identifying problematic areas on the official account and performing an investigation on the ATM part of the incident allowed to focus in on three areas of interest for the research interviews and provided guidance towards the production of the questionnaire that can be found in Annex C. The considerations and processes described above resulted in the production of four subsections and can be found in the chapter “Presentation of the case”.

The theoretical framework for the critique of the AAIB report and the construction of an alternative account is predominantly derived from Dekker (2005, 2006, 2007). This is done for several reasons. First, “The Field Guide to Understanding Human Error” today represents the only hands on guidance to operationalize new view perspectives pragmatically within the existing investigation framework in accordance with international regulations. The positions regarding human performance can however also be found in i.e. Snook (2000) and Hollnagel (2004). The latter reminds us how “accidents are due to usual actions under unusual circumstances, rather than unusual actions under usual circumstances” (p. 181).

Further the experience of recent years in the production of internal investigations indicate that the form of qualitative information in a narrative is more comprehensible to uninitiated audiences than the application of complex tools and their hardly decipherable illustrations such as STAMP proposed by Leveson (2002) or FRAM by Hollnagel (2004). Further it is probably not beneficial to overload the reader with partially redundant human factors terms, even though concepts from Hollnagel such as performance variability (2004), the ETTO principle (2004, 2009), Vaughan's (1996) normalization of deviance or Perrow's (1984) analysis of complexity and coupling to name a few could all provide leverage for explanations instead of judgments. In this sense the alternative investigation proposes a relative pragmatic approach that in work as responsible for occurrence investigations has proven to be feasible, useful and understandable for practitioners and audiences that may not have an academic background in safety and human factors.

A second language problem:

A particular problem anticipated in this research was the multilingual environment in which the research was embedded. The AAIB report exists in 2 languages, French and English for which the French one is the legally binding. All interviewees would most probably have French or German as mother tongue and some might prefer to discuss the case on the basis of the French version. The English and German interviews did not pose any problems, since I am fluent in both languages and the English report is created by the AAIB exactly for the audience that is not able to read the French original. Whereas proper assistance had been assured if an interview would have to be held in French, all interviewees turned out to have a good understanding of the English language. The interviews were all held in either German or English. None of the participants had problems with comprehension of the provided English documentation but two interviewees preferred to use the French AAIB report as working document. In advance a

comparative reading of both versions of the AAIB report had been performed, in which no qualitative differences of the accounts were found. The sole remarkable difference was that the French version described the events in the present tense while the English account was in the past tense. The conclusion was that none of the descriptions, judgments and findings had been amended through the process of translation.

In order to assure efficient use of the interview time a German translation of the research questions had been created in order to bridge any comprehension problems that might arise. Comprehension was never an issue but it helped to facilitate a free flow of information from the concerned interview partners.

Problems in finding voluntary participants:

This research touches on issues that are embedded in aspects of shame, fear and sometimes structural secrecy, which made it difficult to motivate potential interviewees to volunteer information in the frame of such interviews. In an attempt to mitigate this three strategies were applied. One was to demonstrate multi-level support for the research. This was done by obtaining a letter of introduction by the CEO of my employer based on a proposal by Yin (2003, p. 71) and encouragements for participation towards a number of potential interviewees by the local ATCO association. The second was an attempt to reduce any reservations towards participation by explaining the exploratory scope of the research, which stipulated that none of the information obtained in this research would be judged by the researcher but solely used to achieve a deeper understanding of the issues raised. The third strategy was to reduce anxiousness by proposing a confidential framework as described below.

Confidentiality:

Due to the sensitive matter of the issue and in order to reasonably assure that no negative consequences could befall any participants of this research all data was de-identified and functions only referred to where necessary for the understanding of the content.

Interviews:

Two full interviews were held with the concerned Controller. The first had the form of an occurrence investigation interview, lasted 3 hours and together with the recorded data created the basis for the creation of an alternative investigation report. The second interview lasted approximately 2 hours and provided information on all the activities that took place after the incident. It included personal accounts and collected documentation of everything that concerned the AAIB investigation, the release of the report, the judicial investigation and the eventual acquittal.

7 invitations for research interviews were sent out and eventually resulted in 4 interviews with a total of 5 participants (in one interview two interviewees participated). The interviews enabled the collection of accounts from prosecution, defense as well as from the FOCA and except for the public prosecution all other interviewees had the aviation industry and its legal framework as a special domain of their expertise. All interviews took place in an open and friendly atmosphere and with a mutual interest in the discussed topics, which led to sessions well above the originally envisaged 60 to 90 minutes.

All informants were asked to read the concerned AAIB report and the alternative account in advance in order to ensure efficient use of the interview time.

The interviews used the annexed questionnaire (Annex C) as guideline. However it was not followed schematically. If the discussions “took off” the opportunity was used to go with the flow and use the questionnaire as a checklist in order to revert to issues that needed further probing. Handwritten notes were taken during the interviews in order not to intimidate any interviewees with recording devices and transcribed into summaries within the following 24 hours while the conversations remained fresh in memory. Since most interviews were held in German the production of the summaries also included a translation of the collected data into English. The interviewees all possessed excellent English skills but discussions could be held much more effortlessly this way. In order to ensure the correct understanding and reproduction of the interviewees’ accounts an electronic version of the summaries was forwarded for review as soon as these were produced. The summaries were structured around the questions derived from the questionnaire. These were also reproduced in the summary document as a Questions and answers (Q&A) list and all interviewees returned their feedback within a few days using the comment and track changes functions in Word to introduce desired corrections. This approach has been applied for years in incident investigations within the Swiss Air Navigation Service Provider (ANSP) and experience including operator feedback provides reasonable assurance that the interviewee’s account is reproduced in a manner that preserves what he/she wanted to express.

Data analysis:

The interpretation of the data concentrated on learning how judicial assessments were performed and understanding the role of language when human factor issues described in the case were interpreted in a judicial context. For this, statements from the interview summaries were grouped into themes. The statements in these themes were then interpreted with regards

to their contribution to answering the different layers of the research question such as language, processes, roles and responsibilities as well as underlying values.

Personal biases:

One aspect of scientific research is to eliminate, minimize or account for sources that could disturb the precision or validity of data. In interpretative work questions of personal biases consequentially emerge. One way to reduce the impact of personal biases is to realize their existence and apply a conscious attempt to minimize their influence. Hence a short reflection regarding this thesis-work.

The aeronautical industry is troubled by the apparent increase in criminalization of human error on multiple levels. The two most prominent areas of which are; first the personal burden of facing criminal investigations or charges for occurrences that are perceived as unwanted outcomes of normal work and second the consequential reluctance by fellow operators to voluntarily share information on incidents in the future. These issues affect my daily work both personally and professionally. Hence my compassion and sympathies are with fellow colleagues who suffer the consequences of such proceedings and the work that needs to be accomplished in occurrence management is severely hampered by the collateral damage that inevitably emerges as information flow is reduced. Reporting of occurrences with ATM-contribution is an important feedback loop for an organization that wants to make progress on safety. But the fear of self-incrimination has let reporting levels of these incidents drop substantially. Still when I performed my research I applied the same principles, which have been internalized through my work as investigator. These values can briefly be described as an acknowledgment of the local rationality principle and the recognition that people do not come to work to do a bad job. Further I

attempted to apply a curiosity in teasing out the what, why and how regarding the assessments and actions within the judicial system and how they may have made sense at the time.

Validators in detail:

To validate the analysis results, they were subjected to a process of triangulation with two experts in the field, who seemed appropriate for the task.

Mr. Stephane Barraz:

Mr. Barraz has many years of experience in ATM – safety management and has studied Human Factors and System Safety at Lund University.

Mr. Tom Laursen:

Mr. Laursen has a vast experience as ATCO in three different countries, several years of experience in ATM- safety management and has studied Human Factors and System Safety at Lund University.

Presentation of the case:

The presentation of the case consists of 4 subsections. The first section presents an outline of the incident based on “factual information”. This thesis-work will not discuss the epistemological and ontological problems of stating facts. Factual information in this context refers to information that can be established through recorded data of radar trails and radio communication and on which there is a consensus in the aviation business that they constitute neutral and factual information. This section will also attempt to provide some additional explanations for the reader who has only limited knowledge of the aviation terminology.

The second part will discuss the analysis section of the AAIB report. In this section judgmental statements will be identified through a review process that operationalizes human factors concepts and typical artifacts of investigations in hindsight as proposed by Dekker (2005, 2006). Further some inconsistencies and the absence of certain elements will be discussed.

The third section will contain an alternative account of the incident based on first hand information of the incident and with the aim to introduce a rhetoric that explains performance instead of judging it and attempts to also address some of the organizational issues that emerge from this perspective. While the AAIB report also describes the pilot actions, only the controller perspective will be treated in detail here. The two main reasons for this reduced scope are that only the controller ended up facing judicial proceedings and only here first hand information could be obtained for this research.

The fourth section will briefly describe the events that the concerned controller encountered in the aftermath of the incident, from the filing of a report, to the AAIB investigation and the legal proceedings.

Section one; factual information:

The incident took place at the Airport of Geneva on Monday the 26th of April 2004 at 13:15 Universal Time Coordinated (UTC), which in this case means 15:15 local time. To be consistent with the information in the AAIB report and avoid confusion all time references here will be made in the UTC format. The Airport of Geneva has one concrete runway (RWY) and a small parallel grass RWY. The RWY can be used in both directions and the direction in use is indicated by the RWY's name. Further the RWY is connected to the apron and gates via a taxiway-system that is designated with letters. For illustration see Annex 3 of the alternative investigation report.

This afternoon the RWY in use was 05, which indicates its magnetic orientation to the northeast (heading 050°).

At 13:09 a Lufthansa (DLH) Flight 3703 was getting ready for departure and had commenced rolling (taxiing) on taxiway G and called the tower on the designated frequency. At this time a Swiss (SWR) flight 607N was on short final for RWY 05 and at 13:10 a KLM flight 1931 called the tower controller (called TWR during the remainder of this section) and reported that it was established on the Instrument Landing System (ILS) for the final approach to RWY 05. The TWR asked DLH3703 if he was ready for an immediate departure, to which the DLH responded in the negative. While these aircraft were operating under Instrument Flight Rules (IFR), the TWR was also handling several aircraft flying under Visual Flight Rules (VFR). While these mostly consist of smaller privately operated aircraft and are not subject to the same separation criteria, the airspace in the vicinity of the airport is classified in a manner that necessitates an entry- and crossing- clearance via defined VFR routes in order to avoid that such flights conflict with departing and landing traffic. During the next three to four minutes a helicopter and two small aircraft called the TWR to obtain such clearances, while the controller was simultaneously handling the IFR traffic. At 13:11 the TWR cleared SWR607N to land. Shortly after, DLH3703 reported ready for departure. The TWR told the DLH3703 to hold short [of the RWY] and informed the pilot that he could expect line up after the second landing aircraft. At 13:13 SWR607N landed. While this aircraft vacated the runway and the TWR was giving traffic information to potentially conflicting VFR traffic, DLH3703 entered the RWY and lined up for take-off. At 13:14 the TWR cleared KLM1931 to land. Approximately 10 seconds after this clearance DLH3703 informed the TWR that he was on the RWY. The TWR responded by immediately clearing KLM1931 to go around. KLM1931 initiated a go around at about 0.5 Nautical Miles (NM) final at an altitude of 1700 Feet (FT)/AMSL (Above Mean Sea Level).

Subsequently DLH3703 was informed that no clearance to enter the runway had been given and was eventually cleared for take-off. Before being transferred to the departure sector DLH3703 was informed about the TWR controller's intention to file a report. KLM1931 received a second line up by the approach controller after which he landed uneventfully.

Section two; the AAIB analysis:

While this section will discuss some central issues, the full AAIB report is attached in Annex A. Further a selection of human factors terms and typical artifacts of investigations in hindsight, which will be used in this section, are briefly described in Annex D.

The analysis section of the AAIB report commences by describing the difference between what was stated in the Clearance by the TWR “hold short, expect departure behind the second landing traffic” and what was actually understood by the pilots of DLH307 “Hold short of RWY 05 and line up behind the next landing aircraft”. Subsequently it is highlighted that the term “Roger” is insufficient and does not constitute a read-back. This is an example of what in human factors literature is described as micro matching (Dekker 2006, p. 29-33) in order to derive counterfactual reasoning (Dekker 2006, p. 39-44). Performance fragments are removed from their original context and matched against a standard procedure in order to arrive at a judgment about what should have been done. No further attempts are made in order to explain the actions in context. Since this communication fragment becomes a central issue in the judicial proceedings, local rationality (Dekker 2005, p. 61 & 2006, p. 13) from the ATCO perspective will be revisited in the third section.

The following paragraphs concentrate on further shortcomings of the DLH3703 crew. They “should have ensured visually that the final approach was free, while lining up” and apparently

did not use TCAS (Traffic Collision Avoidance System) to detect any traffic on approach either. Judgmental statements, here again in the form of counterfactual reasoning, dominate over any attempt for explanation, as in looking for the why with regards to the pilots' actions. Also the term "apparently" could indicate that this was not discussed with the pilots? For consideration, an aircraft on 4NM final is 7 km away. What are the actual possibilities to visually detect such an aircraft and simultaneously assessing the adequacy of the separation, as the crew is entering the runway at a straight angle and subsequently turning away from the final while preparing for departure?

The subsequent paragraphs are relevant when assessing the severity of the incident. Here it is described how DLH3703 detects the landing clearance for KLM1931 and informs the TWR about its position on the RWY. Further it is established that the KLM crew had visual contact with the DLH on ground and where about to autonomously initiate a go-around procedure when the identical clearance was issued by the TWR. These actions both contributed to reducing if not avoiding the risk of collision. Also here however the investigation is "surprised that the pilot did not inform the Control Tower at this time, that he was not able to comply..." Again counterfactuals dominate over explanations. Maybe the pilots could have answered the question? Actually they did partially explain the reason for their actions. The last paragraph in the findings section cites a written statement by the pilots:

According to his report, the pilot of the aircraft KLM1931 declared that he had been cleared to land when he was a about 1000 Ft in the ILS, that he had observed an aircraft lining up on the runway, expecting it to take off immediately. At a height of about 300 ft he decided to go around, given that the aircraft was still in the holding position. (AAIB report no 1849, p. 4)

While formally and from a micro matching perspective the statement of the AAIB is correct with regards to the procedures (It is in general not allowed to issue a landing clearance for an occupied runway) it could have been interesting to obtain more knowledge from the pilots, whether such an erosion of safety margins was encountered more than once and whether this influenced their decision to initially continue the approach and monitor the developing situation.

The final section of the AAIB analysis then concentrates on the TWR controller. While stating, that “traffic load at the time of the incident was heavy”, the investigation subsequently states, that “the aerodrome controllers attention was distracted”. The term distracted is one that was also discussed in the research interviews. While this statement did not provide conclusive data during the interviews with regards to culpability it may participate in the creation of associations that point towards a lack in professionalism and a kind of willfulness as in the commonly used phrase “you let yourself distract”. It is also an example of what Dekker (2006, p. 33-35) describes as cherry picking. The investigation is picking/selecting those performance fragments that helps their a priory argument, which is the account of unreliable individual performance.

The following two paragraphs make a clear link between actions or rather inactions of the controller and the responsibility for the mishap:

The Aerodrome controller did not visually monitor the application of the clearance issued to aircraft DLH3703 and gave a landing clearance without confirming visually that the runway was clear.

Since the instruction to hold short of the runway had not been read back, the controller had not received any assurance that the pilot of the aircraft DLH3703 was going to carry out this instruction. From that point onward, the risk of an incursion became possible.

(AAIB report no 1849, p. 5)

This could likely be seen as an attribution of the entire responsibility. The first paragraph points towards an obligation to perform a visual check of the runway when giving a landing clearance, which the report claims was not done. The second paragraph basically states that it was the controllers responsibility to insist on a correct read-back by DLH3703 and that by omitting this action the risk of the incursion was made possible. Repeatedly the technique of micro matching and cherry picking result in counterfactual statements of what should have been done instead of explaining what happened and why it happened. These paragraphs, which end up as causal explanations in the AAIB report, will be re-visited in the alternative account and were discussed in the research interviews.

Towards the end of the analysis, the investigation cites the controller for expressing a wish for assistance from a tower coordinator (TRC). Further it is described that the tower unit can be split into 3 control positions during periods of heavy traffic loads. While exactly this term is used to describe the traffic situation the controller found himself in, the final analysis of this issue reads as follows. “Since the concept of heavy traffic load is interpreted in different ways, the TRC control station is not systematically occupied.” (p. 5). This issue could have provided leverage for a deeper “look into the organization” (Dekker 2006, p 159-172), with regards to i.e. staffing issues, but is not followed up in the report. The absence of such a section implies relatively little significance to the issue of workload and reduces the controller’s request for support to a personal opinion.

The cause is then attributed to three facts of which two are attributed to the controller:

“The crew of aircraft DLH3703 did not read back the clearance which they did not understand”

“The controller did not ensure that the clearance he had issued had been understood”

“A landing clearance was issued without a prior visual check of the runway by the aerodrome controller”.

To remain in the terminology of Dekker (2006) the investigation has now filled its shopping bag (p. 35-36) in order to support its narrative of the Bad Apple (p. 1).

As a little footnote the report states as a factor affecting the evolution of the incident: “Absence of assistance for the aerodrome controller in a situation of heavy traffic load”.

Stating the causes as facts administers an ontological status of objective truth to these findings. In combination with the status of the AAIB as official public expert institution, there is little if any room for other accounts of what happened.

The safety deficit rephrases the causal statements and while the recommendations were probably not influential in the subsequent judicial assessments, they will shortly be discussed here in order to complete the critical review.

The recommendations ask for the introduction of stop bars at the airport and for courses that improve English phraseology during refresher training.

While the implementation of stop bars may be helpful (and they actually were installed shortly after) the introduction of this item in the recommendations, without any prior treatment anywhere else in the report, does not provide any means for traceability (see Dekker 2006, p. 119-133). There is a detachment between the analysis, its findings and the presented recommendations. No explanatory link is presented between these sections that would allow an audience to understand (trace) how the investigation arrived at these proposed countermeasures.

The report never discusses the absence of stop bars or the potential benefits of their introduction in the analysis. Also the need for training of English phraseology, due to some identified lack of

skills, has not been established in the report. All that can be concluded from the analysis is that people did not follow the prescribed rules. But rule adherence is not stressed as a consequential recommendation. Even though the investigation does not provide the traceable connection between its findings and its proposed countermeasures, these measures match what Dekker identifies as typical reactions to the identification of bad apples. These regularly comprise demands for more technology in order to “automate human error out of the system” (2005, p. 151) and from the belief that “safety improvements come from organizations telling people to follow procedures and enforcing this” (2006, p. 157).

Note: This should not be understood in the way that new technology per se cannot be useful.

Section three; the alternative account:

Analysis:

[In this section the tower controller is referred to as the controller]

The controller who was working at the time of the incident performed multiple functions that varied throughout the rostering. He was licensed to perform operational tasks as tower controller, radar approach controller and supervisor. Further he participated in formation of new controllers as instructor in the simulator, classroom instruction including TRM (Team Resource Management) as well as on the job training.

The day of the incident, the controller started work at 10:00 on a tower supervisor shift, which lasted till 17:00. The tower supervisor during the shift handles a series of supervisory tasks from a separate position in the tower. The tasks may also include administrative tasks that may be

partially performed in offices below the tower cab. Further this particular tower supervisor shift included a one-hour session as tower controller in order to facilitate a break relieve for the regular controller shifts. During this session another person was responsible for the supervisory tasks. The controller could not recall whether this supervisor was present in the tower cap during the minutes around the occurrence.

The handling of traffic that day was characterized by good visibility with a number of VFR movements as a consequence. Two particular problems had to be integrated in traffic management that day. The grass runway of the airport was closed, which meant that small VFR aircraft had to be integrated into the arriving and departing IFR traffic. This task was further complicated by a wind shear situation in the vicinity of the airport which meant that traffic landing on RWY 05 would have 3 to 5 kts headwind upon landing but 15 kts tailwind on 10 to 15 NM final. For this reason options to change to the opposite runway were considered and discussed with the approach sector during the day but eventually dismissed due to the consequential tailwind landing. Besides the tasks connected directly to the handling of traffic by monitoring and voice communication, the controller also has to enter landing- and departure times into a computer and coordinate details with approach or apron control.

When DLH3703 first called the tower, the controller immediately considered the possibilities for integrating the departure into the landing sequence. At this time SWR607N and KLM1931 were established on the final approach. Since DLH3703 was already close to the holding position and there still would be sufficient spacing to depart in front of SWR607N the controller inquired about the possibility for a rapid departure. Since this was answered with a negative, the controller evaluated the subsequent possibilities. The KLM1931 was still flying with a relatively high speed - partially due to the windshear - and as a consequence, closing in on the preceding SWR607N. The first possible line up would be after the landing of the KLM1931. The controller then

cleared SWR607N to land. Immediately after, a VFR helicopter made its initial call on the frequency.

The controller was at this time temporarily occupied performing other tasks and hence asked the helicopter to stand by.

While the flightplans of IFR traffic are known and already exist in the traffic management systems, the details regarding VFR traffic requesting to cross the CTR/TMA are unknown to the controller and have to be obtained through communication on the frequency and manually producing a flight progress strip or writing the details down on a piece of paper.

As the controller was preparing the reception of these details for the helicopter, DLH3703 reported ready. The controller saw the aircraft standing at the holding point and replied with “Roger, hold short, expect departure behind the second landing traffic”, which was read back with “Roger, DLH3703” by the pilot. The controller stated that he had the intention to clarify to the DLH pilots that they should remain at the current position and additionally provide them with a service-information about when they could expect line up.

While the handling of other tasks became more pressing with the call of the VFR traffic, the communication with the pilots was also commensurate with the controllers understanding and expectations of the situation. The communication did not include any new clearance since DLH3703 had never been cleared to enter the runway. Hence the hold short had the function of a confirmation of the prevailing restrictions and additionally the pilots were informed about what to expect next.

Subsequently the VFR details were obtained and a routing clearance via defined VFR reporting points given. Immediately after, EZS986 made its initial call on final runway 05. A few seconds

later the VFR flight HBCHW called on the frequency for entry clearance and requesting to land at the airport. Since this aircraft had departed from Geneva its details were known to the controller but its integration for landing on the concrete runway had to be considered. HBCHW was approaching point E from the east and the controller realized that it was on conflicting course at the same altitude (altitude derived from the clearance on the strips) with HBxNJ, which was routing from points SE to E. The controller hence issued traffic information to the two aircraft, in English for HHW and in French for HNJ.

The tracking for which aircraft is handled in which language is achieved by stripmarking (F for French R/T). [Handling of traffic in ATC is often assisted by the application of flight progress strips that contain information of the flight and the clearances that have been issued. These are continuously updated by the controller while managing traffic]

The attention was hence rapidly shifting between strips and radar while providing traffic information. According to the controller, he then went on to perform a visual check of the runway prior to giving the landing clearance to KLM1931. He stated that this was an integral part of the workflow that was never skipped and that it was definitely performed in this case since the controller needed absolute assurance that SWR607N had fully vacated the runway and because he wanted to verify the position of the KLM1931.

The DLH3703, which had entered the runway, was not detected. SWR607N was then transferred to the apron and immediately after, DLH9KW called in preparing for departure.

The controller stated not replying to DLH9KW because he was starting to realize the developing conflict. This realization was confirmed by DLH3703 informing the TWR about its position on the runway. The controller immediately issued a go around clearance for KLM1931, who

responded accordingly. After a short exchange with DLH3703 on the differing understanding of the situation, the aircraft departed as planned.

The controller continued to work on the position as scheduled and subsequently filed an operational internal report (OIR) to inform about the occurrence.

Conditional clearances and closing the loop through read-back:

The AAIB investigation emphasizes that the reply by DLH3703 “roger” is insufficient as a read-back. While formally this may be correct it provides little explanatory leverage. Dekker (2005) states: “There is always a distance between a written rule and an actual task.” (p. 136). Since exactly this fragment of communication became a central issue in the legal proceedings, a few explanations are necessary here.

In the ATC standard phraseology the possibility for a conditional clearance is given but also very prescriptive in the way it needs to be executed. In this case a conditional line up clearance, as understood by the aircrew, would have been. “DLH3703, behind landing Swiss jumbolino [name of the aircraft type and company optional] line up behind and wait”. This should then be fully read back by the pilot in order to assure that the clearance was correctly received and acknowledged by the controller with “correct”.

In the given clearance the “hold short” constitutes a clearance while the remainder is information for which no read-back is required. The controllers at the airport of Geneva are further instructed to never give conditional line up clearances behind a second landing aircraft, because the risk for a false interpretation of the sequence is too high. In this context the clearance and the read-back was commensurate with the expectations of the controller. The clearance hold short was simply a

reiteration of the current clearance limit, which was the holding point where the aircraft had already stopped prior to the R/T exchange. In the given situation the controller did not question the read-back for two reasons. The workload had started to increase and the VFR helicopter was still standing by for its initial call. Further the controller stated that he would have expected a completely different type of read-back if the crew of DLH3703 had perceived the communication as a conditional line up clearance.

Two minutes later the transfer of SWR607N to the apron frequency was not read back either. Again the workload did not allow to prompt the crew for a read-back and while this happens regularly, the controllers have developed a coping strategy to verify the transfer. The aircraft about to vacate the runway is not allowed to enter the apron without a clearance. If it can be visually confirmed that the aircraft is taxiing further, this is taken as positive indication for the achieved transfer. Should by any means the aircraft enter the apron without having established contact, the apron would call the tower controller immediately.

Traffic load vs. task load:

During the period between 13:09:00 and 13:17:30 six IFR and four VFR flights were handled by the controller who at the time was performing all tower operations alone. Because the number of flights provides limited information about the actual workload situation, the investigation has constructed a timeline covering mainly the R/T communication. It should be noted that other tasks at this time included manually producing flight progress strips for 2 VFR flights, entering landing and departure times for the handled IFR traffic and at least one telephone coordination. Unfortunately the recording of the phone line was not retrieved, which is why the exact data could not be entered into the timeline.

However already the R/T load illustrates the fluctuation of the task load and shows a peak between 13:12:20 and 13:15:10 where the frequency was practically used without interruption. It is also during this period that essential traffic information had to be given to conflicting VFR traffic. The excessive workload and the additional fact that also within this period the runway incursion by DLH3703 was not detected, strongly indicate that the controller was momentarily task saturated.

Human performance limitations:

The timeline supports the finding that the controller was temporarily task saturated. One of the known consequences of such stress is tunneling – “The tendency to see an increasingly narrow portion of one’s operating environment” (Dekker, 2006, p.142). It can be described as an involuntary coping mechanism that allows the operator to keep a robust picture of a limited set of information at the sacrifice of other sources. Under such conditions, audible as well as visual information can remain undetected.

Staffing:

The incident occurred while the controller was operating the tower on his own. This is considered normal practice in periods with low traffic. As this incident demonstrates, there is however no symmetry between traffic load and workload. Further, on days with VMC conditions, it is impossible to anticipate the additional workload that may be created by VFR traffic.

According to the official statistics of AIG (Aéroport Internationale de Geneve) the total number of movements (starts and landings not VFR crossings) in 2003 was 163.760 and almost 8.1 million passengers were handled.

The working unit has had problems with understaffing for years and the rostering has been optimized to a point where the supervisor provides the break relief for the operational controllers. A second supervisor performs the supervisory duties but is not necessarily present in the tower at all times, which hampers the ability for the controller to rapidly ask for help.

New technology:

Two types of technological equipment, which could have helped avoid or detect the incident, will shortly be discussed here.

Stop bars that are lit at the holding positions can provide an additional visual aid for pilots to verify their clearance limit. While such bars in certain conditions still can create misunderstandings that will not be discussed here, it would most probably have helped to prevent the aircrew from entering the runway prematurely.

The airport of Geneva has implemented surface movement radar called SAMAX, which will become operational in October 2004. (Note: the attached image in the AAIB report is from a period where the system was in a test phase) This radar can be equipped with a monitoring aid called RIMCAS that provides an alarm when an object enters the runway without a clearance. While also such systems are not without deficiencies it is most likely that the controller would have been alarmed immediately when DLH307 entered the runway.

[In 2010 while the case study is performed, the stop bars have been in operation for several years, and the RIMCAS has been implemented in Geneva since December 2009]

Safety nets:

While no technological safety nets were in place to assist the detection of the emerging situation, the problem was detected by the DLH307 crews monitoring of the frequency and immediate response to the landing clearance as well as by the crew of the KLM1931 who had visual contact with the aircraft on the runway and was about to autonomously initiate a go around simultaneously with the controllers clearance.

Conclusion:

In a position with minimal staffing the controller had to handle traffic under circumstances which added to the complexity such as wind shear on final and unavailability of the grass strip in combination with VMC conditions and the consequential increased VFR activity. A communication breakdown in combination with a temporary task saturation led to an undetected runway incursion. The human redundancy of the aircrews and the subsequently immediate response of the controller helped to reduce a risk of collision.

Recommendations:

Due to the scope of this account as a thesis project and not a formal investigation, I will refrain from stating any recommendations that could install confusion about their status out of context.

Section four; post incident record:

On the 26th of April 2004, after completing the controller part of the shift, the supervisory tasks where resumed and an Operational Internal Report (OIR) was filed as prescribed. Under severity the controller marked “serious” which constitutes the most severe classification on the sheet. In the research interview the controller stated that operators are not experts in severity assessment

and that this was predominantly an emotional response to the unpleasant surprise of the runway incursion and a wish that the potential danger of such a situation would also be communicated back to the DLH-pilots.

A few days later the Swiss AAIB announced that an official investigation would be opened and exactly one month after the occurrence on the 26th of May 2004 the investigation interview was held. To this interview the controller chose to be accompanied by a legal advisor of the employer. The interview itself did not give cause to any serious concerns on behalf of the controller.

At his time the organization had not yet established an independent occurrence management. Internal investigations were performed by the local operations manager. Such an investigation did not take place in this case. Information on the concrete case could not be obtained but most probably it was seen as an improper redundancy to the AAIB investigation.

In February/March 2005 a draft report of the AAIB investigation was sent to all stakeholders. During a 60-day hearing period all concerned parties can file corrective proposals or complaints, which will be taken into account by the AAIB investigation, who subsequently decides on the final content. The controller was not satisfied with the draft and considered filing a complaint against some of the descriptions of the air traffic management (ATM) aspects. A meeting was organized with the legal advisor of the employer but the formulation of arguments turned out to be a cumbersome process and the plan was finally abandoned. Part of the rationale for this was that the report content in large resembled the other AAIB publications at the time and that there would be nothing to worry about. [Note: at the time no formal assistance was offered to individual operators in reviewing AAIB report drafts. They were hence left with sporadic attempts of colleagues through their association or the company's legal department. Today this feedback-loop has been institutionalized via the occurrence management who collects input from

all levels of the organization and provides a proposed answer, which includes the introduction of this units human factors and investigation know how].

The operations department, being discontent with the statements regarding traffic load, filed a complaint which lead to the introduction of the following statement in the report: “Since the concept of heavy traffic load is interpreted in different ways, the TRC [Tower Coordinator] station is not systematically occupied”. (AAIB report no 1849, p5)

The AAIB report was officially released on the 12th of May 2005.

Switzerland as a federation of 26 Cantons has divided tasks for public prosecution in the aeronautical domain in the following way. While pilots can have multiple employers and their working environment is geographically dynamic, all judicial proceedings here are performed on a federal level. For controllers who have more fixed workplaces, either a tower-approach unit or an area control center, the judicial proceedings are delegated to the respective cantonal state prosecutor or judge of instruction as the title is in the Canton of Geneva. The coordination with regards to AAIB reports will however still be performed on the federal level. For severe incidents (Airprox A & B), which are investigated by the AAIB, the release of a report subsequently triggers an inquiry by the federal department of public prosecution the legal department of the Federal Office of Civil Aviation in order to determine whether judicial proceedings should be initiated.

Such a letter was sent from the federal department of public prosecution to the FOCA on the 16th December 2005 asking for a conclusion from the perspective of the FOCA whether or not some of the behaviors described in the AAIB report were seen as punishable.

This inquiry remained unanswered for almost 17 months after which the federal department of public prosecution on the 7th of May 2007 restated its inquiry demanding an expeditious reply.

On the 13th of July 2007 an official answer was delivered by the FOCA:

For the aircrew of KLM1931 no negligent actions were identified.

For the aircrew of DLH3703 the assessment stated that regardless of whether the clearance had been understood as intended or as a conditional line up, the pilots neglected their obligations to fully read back any clearance they received.

Regarding the behavior of the controller the FOCA stated that in the situation of an incorrect readback by the pilots he should have repeated his clearance and demanded a complete readback. By neglecting this action, the controller exposed himself to a dissension [mésentente] [here risk is probably the most correct translation], which then actually occurred.

With regards to the landing clearance it is stated that such a one cannot be given without the prior visual verification by the controller that the runway is clear. In this case it seem that the controller equally neglected to perform this control by either looking directly out on the runway or by consulting his ground radar screen.

[Comment: The account very much resembles the AAIB report with the exception that here the legal term negligence is introduced].

These statements lead to the appointment of the judge of instruction in the Canton of Geneva to open a judicial investigation. While the investigation started in August 2007, the controller

received an official announcement including an indictment for endangering public traffic on the 4th of February 2008.

The controllers association upon notification provided their mandated lawyer to provide the defense.

In May 2008 the controller was interviewed directly by the judge of instruction for approximately 3 hours. The main content was of more general nature regarding formation, licensing and the medical licensing of the controller.

The following activities were almost exclusively handled by the defense lawyer. These proceedings left the controller in a stressful passive waiting position for more than a year.

The defense lawyer provided the judicial investigation with an explanation on the application of go-around procedures signed by the pilot association of a major airline and the employer of the controller also contributed with a document that aimed at demonstrating that no concrete endangerment had taken place.

Finally the controllers association produced a technical rationale in order to demonstrate that no actual endangerment had existed. It provided a calculation, which proved that because of a displaced threshold between landing and departing aircraft, even in case of non-detection of the DLH3703, the KLM1931 would have overflowed the DLH3703 and landed in front of it. The correctness of the technical rationale was confirmed by the FOCA experts, which lead the judge of instruction to close the judicial investigation in April 2009.

Around July 2009 the controller received information that the accusation would be reduced from endangering public traffic to disturbing public traffic. Since this was insufficient for further criminal investigations the case would be closed, although with an option to re-open the investigation, if new facts or circumstances would arise.

This led the defense lawyer to file an appeal against the decision, demanding an acquittal and hence total rehabilitation of the controller. Such a one was finally granted by a commission in October 2009.

The controller was informed about closure and acquittal of the case by his lawyer on the 13th of October 2009.

Results:

The Swiss judicial framework in brief:

Switzerland is a confederation of 26 Cantons, each of which has far reaching autonomous authorities.

The Swiss judicial system, as probably several others at least in western society, is based on two main pillars. These are civil law and public law. Public law is further subdivided into administrative penalty law, and criminal law. For all of these pillars of course numerous categories of domain specific laws exist. Also some of the laws are embedded in or derived from international regulations. Here only deal the main topics that are relevant for the ATM domain will be dealt with.

Civil law is only applicable based on lawsuits by civil citizens (single or groups) against individuals, groups or organizations in order to determine liability and compensation for losses. Hence it is applied for accidents but never for incidents such as this research case.

Public law deals with three levels of severity. The first level is that of an infraction [Übertretung] and is dealt with under administrative penal law. The two next levels are malfeasance [Vergehen] and felony/crime [Verbrechen].

Administrative penal law, which deals with smaller infractions, is for the aeronautical industry handled directly by a legal department of the FOCA. Where deemed appropriate operators can be fined by the FOCA for such infractions of which the regulator is notified. The regulatory framework is based on federal aviation law and all derivatives in the form of local procedures and

regulations. According to Interviewees from the regulator approximately 95% of all aeronautical occurrences are dealt with directly under this legal framework.

Criminal law is dealt with on a federal level for pilots due to the mobile properties of their working environment and on a cantonal level according to their workplace for air traffic controllers. Since this falls under public law the state prosecutor, with a mandate to protect the public, must act on any supposedly criminal act that comes to his attention. This attention can be attained through any applicable source including media reports or as in the studied case through the publication of an AAIB report. Since AAIB reports on incidents only are produced in cases of high severity (Airprox A and B) they subsequently become subject for a judicial assessment on possible punishable acts. Such a report can officially be utilized by the Swiss judicial system due to a strong freedom of information act. The latter has also led Switzerland to file an exemption to the International Civil Aviation Organization (ICAO) Annex 13. Annex 13 is an international regulation on aircraft accident and incident investigation, which also applies for the Swiss AAIB together with national laws and regulations. ICAO states the following as its objective:

“3.1 The sole objective of the investigation of an accident or incident shall be the prevention of accidents and incidents. It is not the purpose of this activity to apportion blame or liability.”

(ICAO Annex 13, p. 3-1).

In the Swiss Federal Aviation Law this is basically re-stated under article 24, which is referenced in the AAIB report: “This report serves exclusively to prevent accidents. The legal assessment of accident/incident causes and circumstances is no concern of the incident investigation”. (AAIB Report No 1849, 2005,p. 1)

Further under disclosure of records ICAO Annex 13 states:

5.12 The State conducting the investigation of an accident or incident shall not make the following records available for purposes other than accident or incident investigation, unless the appropriate authority for the administration of justice in that State determines that their disclosure outweighs the adverse domestic and international impact such action may have on that or any future investigations: (Annex 13, p. 5-3)

Due to its freedom of information act Switzerland has filed the following exemption to this article:

5.12 “Swiss legislation requires that all documents be made available to judicial authorities and aviation authorities.”(Supplement to Annex 13, p. Switzerland-1)

As a consequence such reports are fully admissible as evidence in judicial proceedings.

While in deadly accidents articles concerning manslaughter may become relevant, for incidents basically one single article applies. It is article 237 of the Swiss Penal Code on disturbance or endangerment of public traffic:

Art. 237

Störung des öffentlichen Verkehrs

1. Wer vorsätzlich den öffentlichen Verkehr, namentlich den Verkehr auf der Strasse, auf dem Wasser oder in der Luft hindert, stört oder gefährdet und dadurch wissentlich Leib und Leben von Menschen in Gefahr bringt, wird mit Freiheitsstrafe bis zu drei Jahren

oder Geldstrafe bestraft.

Bringt der Täter dadurch wissentlich Leib und Leben vieler Menschen in Gefahr, so kann auf Freiheitsstrafe von einem Jahr bis zu zehn Jahren erkannt werden.

2. Handelt der Täter fahrlässig, so ist die Strafe Freiheitsstrafe bis zu drei Jahren oder Geldstrafe.

(StGB, 1937, p. 90)

Translation:

ART 237

Disturbance of public traffic

1. Who deliberately hinders, disturbs or endangers public traffic, namely traffic on the road, on water or in the air and hereby knowingly endangers the bodies and lives of people, will be punished with imprisonment up to three years or a fine.

If the contravener hereby knowingly endangers the lives of many people, imprisonment between 1 year and ten years can be sentenced.

2. If the contravener acts negligent the punishment is up to three years imprisonment or a fine.

For incidents in the aeronautical industry the judicial system is typically dealing with malfeasance, since the contravention usually occurred by negligence, deliberate actions being rare.

The position of an AAIB report in the judicial system:

As a factual account of what happened all interviewees emphasized the important, objective and official status of AAIB reports. One interviewee explained:

Basically the prosecution has three sources of evidence: Witnesses, factual documents (such as a transcript of recorded data or radar plot) and expertise accounts. An AAIB report constitutes such an expertise account, where a competent domain expertise here additionally in the form of a recognized federal institution can be used directly as evidence base. It can directly provide the hard facts in conjunction with assessments of the involved operators behavior.

Another interviewee highlighted the scope of safety investigations and the applied measures of quality assurance:

Since every AAIB report is reviewed by experts with the appropriate domain expertise (recruited case specifically from the relevant FOCA sections) 3 times during the investigation/drafting process and because an AAIB is produced in accordance with Art 24 of the Federal Aviation Law, such an account can be used directly as a neutral expertise document for judicial assessments.

Two other statements concerning this topic were:

In the judicial system an AAIB report has a high validity, superior to i.e. a police report. Policemen have to create reports on a large number of different domains and can

consequentially not be experts on all issues. An AAIB report on the other hand is produced by highly specialized experts of a public institution.

Obviously, this report was the backbone of our investigation. It comes from a reliable, official source staffed by professionals of the field.

Summarizing these statements, an AAIB report has an ontological status within the judicial framework. This is seen as an objective and true account what happened.

Norms, deviance and the process of objectification:

While civil law can be addressed towards organizations, public law (and in particular criminal law) almost exclusively deals with individuals. In order to establish culpability a public prosecutor needs to establish facts on three levels. First a malfeasance or a crime has to be identified, second an individual act has to fulfill the criteria of negligence or intentionality and third, when dealing with incidents, it has to be established whether a potential or an actual endangerment has taken place and a causal link to the supposedly negligent or intentional acts can be demonstrated.

With regards to identifying negligence the applicable norms and the deviance from such norms have to be described. For this purpose a norm of expected and acceptable behavior is created and compared with the actual performance. Often (as it can also be found in the AAIB report) this is done through a process of “micro matching” (see Dekker, 2006) where written guidance becomes the absolute normative standard. Subsequently, what can be described as a substitution test (A term here borrowed from Reason (1997, p.208) and not part of the judicial vocabulary) is performed. As one interviewee stated:

The actual performance of the operator is compared to one of an objectified domain specific professional [substitution test]. How would an adequately prudent professional have acted in the concerned situation? It is assumed that hindsight is excluded in this process, but this is often not applied in a given case. The delta between the hereby derived norm and the actual performance becomes an infringement, which is subject to criminal law. Since it does not meet the normative standard it must be negligent.

Another central statement during an interview was:

A process of objectification can be achieved through a “substitution test” and with the help of domain expertise. As an example an expert in this case can identify an omission that constitutes a violation of official procedures. This will easily be interpreted as a negligent act. An aggravating circumstance would be that it was done consciously, since the operator knew to break a rule of conduct, not thinking however of causing a (concrete) danger by doing this. If on the other hand it can be demonstrated that the operator omitted an action unconsciously it may still be assessed as unconsciously negligent if the expertise indicates that an objectively careful and prudent operator would have realized this.

Regarding the consequential questions on how or where to draw the line and the status of human error in the judicial system, one interviewee answered:

The prosecution often investigates on the basis of a hypothesis for which evidence is collected. This means that there is (unpunished) room for “error” if it can be demonstrated that any professional and prudent operator would have acted in the same manner.

The central statements that indicate culpability:

During the interviews participants were asked to point out statements in the concerned AAIB report that would indicate possible culpable acts to them. While some focused more on the analysis section and others on the statement of causes, all answers concentrated on the same issues with regards to the performance on the DLH3701 crew and the controller. Here are some examples:

Main focus in this case was the distance between the written procedures and the actions as found described in the AAIB report. These were the Missing insistence on correct readback/ missing visual check for the controller and an insufficient readback by DLH3703.

From the AAIB report the situation around the readback and the visual check are described with terms like “should have” and “insufficient”. These terms direct the judicial interpretation towards negligent omissions. The way these people acted, there must be something wrong here.

Another interviewee identifying the same passages in the report stated:

These statements can basically be copy-pasted into a judicial assessment. Only the correct judicial term for the neglect of duty needs to be introduced.

The AAIB report represents a language that seeks and consequentially finds failure and contributes to the creation of meaning, for the interviewees, that negligent and culpable acts have

been committed. The terms reconfirm beliefs that are so deeply rooted in society that they are no longer questioned. “That failure is caused by failure is prerational” (Dekker 2005, p.5).

This creation of meaning from the investigation report language is also reflected in the eventual indictment, which claimed that the controller contented himself with the “Roger” instead of insisting on a readback and that the AAIB report had concluded that the cause of the incident resided predominantly in the fact that the controller did not assure that his instructions were correctly understood by the crew of DLH3703 and further that the controller issued a landing clearance without a prior visual check of the runway.

Why only the controller?

One pressing question during research was, why only the controller had been indicted. One recurring answer during the interviews was that the descriptions found in the AAIB report seemed to put more weight on the failures of the controller than of the aircrew. The language that connected operator action or inaction to the bad outcome put more emphasis on the controller and finally two of the three causal statements were attributed to the controller.

Further a possible pragmatic approach was described. It would be much more complicated to open such judicial investigations against a foreign citizen including a demand for foreign legal assistance. One interviewee stated:

The major success-criterion for a prosecution is to end judicial proceedings with a conviction - not how many are convicted. Only one culpable is needed to fulfill this criterion and very few cases are rejected by the court because the scope of the prosecution is seen as too narrow or unbalanced. Practicability then easily becomes the

next criteria when several options are evaluated. In the case of accusation/prosecution of a pilot in Germany the state prosecutor would probably have to apply for German legal-assistance, which would have complicated the entire proceedings substantially. It is hence the easiest and most promising approach for the judicial system to concentrate on the Swiss citizen. [In the present case the Air Traffic Controller]

The above statement points towards an institutional response to typical reactions to failure and a societal need to remain in control and regain order and hence a the practical need for human error as a causal explanation. Such mechanisms have been described by Hollnagel (2004), Dekker (2005, 2007) and Rothenberg (2003) and are nicely summed up in Barraz (2009). It could be seen as an artifact of Nietzsche's first principle against anxiety against the unknown and the consequential loss of control, which can be described as "any explanation is better than none" (Hollnagel 2004, p25).

For this specific case however interviews revealed that indictment of the DLH3703 crew had been considered and that a request to reveal the pilots identity had been made by the judicial investigation. While this process was ongoing, the technical rationale, which demonstrated the absence of actual endangerment, had been received. Consequentially further steps became obsolete as the criminal investigation was closed.

Causality and cause-effect equivalence:

While the absolutes of truth and objectivity have already been mentioned above, the judicial system has also institutionalized Newtonian notions of causality and cause–effect equivalence. It should be mentioned here that several interviewee's made a clear distinction between more

relativist personal opinions and what could be described as “the rules of the game” in the judicial system.

A state prosecutor has to establish a causal link between the identified negligent or willful acts and the investigated case. The controller’s actions or omissions must be seen as causes for the incident. Here the language of the AAIB report may be seen as representing identical beliefs. It describes individual failures and creates direct causal links to the outcome. As one interviewee stated:

Main focus was on the conclusion under the “causes” chapter and whether these events (non readback, non demand for readback and absence of visual check) should have been avoidable.

The culpability of the described actions is further largely defined by the severity of the outcome. While this was not an accident the language of severity classification played a role in the eventual indictment. The Case had been classified as Airprox A, the definition of which is an incident in which a severe risk of collision existed. Consequentially the criminal investigation was closed once the actual endangerment was refuted by the technical rationale regarding the displaced threshold.

A recent example of this equivalence was also highlighted during one of the interviews referring to the Überlingen trial. Here the judge when opening the trial stated that “the remaining relatives, who lost their family members in the accident, were entitled to a conviction [...haben Anspruch auf eine Verurteilung]”. So the assumptions on cause affect equivalence bias people including the judicial system into thinking that if we face a really bad outcome it must have been preceded by an equally bad negligent or otherwise criminal action. These often implicit assumptions are then

perpetuated in the language used to describe the events and the subsequent creation of meaning of the reports audience.

Production pressure in the judicial system:

Almost needless to say production pressure and goal conflicts are not exclusive to the aeronautical business. Discussions with FOCA and the state prosecution employees brought forward accounts of incessantly increasing workload. Alone in the Canton of Geneva 15-20.000 cases (including minor offenses) are handled every year. The process for an investigation like the present research case is of course further delayed by the circumstance that domain knowledge is absent and a substantial amount of time has to be invested in trying to understand the aeronautical domain including its excessive amount of acronyms, charts and procedures.

Additionally judicial investigators manage multiple cases. In some of the cases the accused are awaiting the results while in custody and to minimize this time such cases have to be treated with priority.

The possible effect of the alternative account:

The alternative account has safety improvement and organizational learning from occurrences as its primary objective. As such possible interaction with judicial systems have not been considered in advance with regards to the content. It is one of the latest contributions of more than 6 years work on operationalizing the concepts of “New View on Human Error” as proposed by Dekker (2002, 2005, 2006) and attempts to stringently apply the local rationality principle when explaining human performance. While this approach has advantages in making progress on safety and organizational learning (Dekker & Laursen 2007), the hypothesis of this study was that seeing human error (if at all) as a symptom instead of a cause and by exchanging indignation with

explanation, a report could be established that would reduce the likelihood of subsequent judicial suspicion of culpability. The possibility for making progress on accountability and a “just culture” through the application of such an approach is also discussed in Dekker (2007, p 112).

The last formal question during all interviews was the following: “Would it [the alternative account] change the perception of the individual actions and the possible culpability?” The participants’ answers, even though some reservations were made, all pointed in the same direction:

If this account had constituted the official AAIB investigation it might have influenced the assessment. The concerned actions may not have been seen as expressions of negligence or considered as a lower level of negligence.

Once a judicial investigation is opened it will again concentrate on the objectification and the question of danger. Under such proceedings the alternative account could trigger a question whether the “communication breakdown” was acceptable and would also have taken place with adequately prudent professionals. Further the account gives an image of a very service-minded controller and one hypothesis that might be tested is whether too much thoroughness was traded of for efficient service provision.

However, before such proceedings are opened in the first place, the state prosecutor needs to identify a well-founded initial suspicion. It is my opinion that this initial suspicion will not be derived to the same extent from such an account as from the content type of the discussed AAIB report.

The aeronautical business is special with regards to its exposure to media reports. Severe incidents and accidents are not accepted in the same way as with road traffic. Such

attention can also bias stakeholders in the judicial system to open criminal investigations. “The psychology of criminal law” also means that conviction is the main criteria for success. The alternative account gives no indications of negligence. If it had represented the official AAIB report, it would probably not have become a basis for judicial investigations.

The report does not mention infractions to written procedures. I ask myself whether it could be seen as an attempt to talk your way out of the situation. This of course compared to the account I already know. In isolation I see nothing in this alternative report that would lead me to start a criminal investigation.

These statements indicate that language does matter. While creation of meaning from text shows certain variability, which would confirm this as an individual or social process as opposed to the conduit of fixed meaning as discussed in Tassin (2010), there is a convergence towards perceiving the operators’ actions as less or not culpable in the alternative account. Also the level of domain expertise of the reader does not seem to have any substantial influence. The perception of culpability, or the absence of it, here is shared by judicial employees from the regulator who have daily contact with the domain, lawyers with aviation law as special expertise and the prior to this case domain-uninitiated representative of public prosecution.

While this in its core confirms the hypothesis of this thesis – that the normative and judgmental language used in the AAIB report has an aggravating influence in creating perception of culpable acts - the research and its results also brought up a series of issues and questions that will be discussed below.

Discussion:

The discussion addresses frameworks, structures and approaches in which interaction between occurrence safety investigation and judicial investigation and consequentially this research are embedded. Yin (2003) identifies one of the major pitfalls of a case study when it “focuses only on the subunit level and fails to return to the larger unit of analysis” (p. 45). In other words, data should be understood in their context. Hence some of this context will be addressed in the discussion.

Was it just a different language?

One area of critique regarding this study could be that the alternative account is not about the language used but merely an exculpatory account that omits telling where people went wrong and hence eludes the reader into thinking that no-one is responsible.

An answer to this would be “Yes” and “No”. “Yes” because it may not be entirely about language and “No”, because the alternative account is not about escaping responsibility -“au contraire”.

The alternative account, operationalizing the concepts proposed in Dekker (2006), is created with the premise that sees error not as a cause but as a symptom for trouble deeper inside the system. An Air Traffic Controller (subject of this research, but would also apply to the airline pilots) is a carefully selected, highly specialized professional who has to live up to high industry standards, competence and medical checks and continuously receives refresher training. The objective then is not to point out where he went wrong but to investigate why his actions may have made sense at the time (local rationality principle). Because if it made sense to this professional, it may make sense to another one as well. Hence progress on safety can best be achieved by adjusting features

of the working environment in order to avoid or mitigate recurrence. Further it is acknowledged that procedural overspecification of the ATM environment enables almost any investigation to identify a gap between written guidance and actual performance and that this has little explanatory value for making progress on safety. Consequentially this acknowledgment should also be reflected in the proposed mitigations through an attempt to avoid proposals for yet another procedure and demands for more attention or training of operators. Again, explanations for the actual performance are usually found in constraints such as scarce resources (Dekker, 2005, p. 24-25) and conflicting goals (Dekker, 2006, p. 168-171) of an event driven environment.

One consequence of this approach is a language of explanation instead of the normative indignation that can be found in the AAIB report. This language is not about escaping responsibility. Rather it is about assuming the responsibility of the entire organization for safe and efficient services by learning from the event and implementing systemic measures that can help operators avoid similar situations in the future.

In this sense, the AAIB report and the alternative investigation correlate quite well with what Sharpe (2004) describes as respectively backward- and forward- looking accountability. “Whereas responsibility in the retrospective sense [backward looking] focuses on outcomes, prospective responsibility [forward looking] is oriented to the deliberative and practical process involved in setting and meeting goals.” (p. 14).

Such a forward looking account can hence also be seen as an attempt to contribute to a just culture where accounts according Dekker (2007) need to meet to goals. “Satisfy demands for accountability [&] contribute to learning and improvement”. (p. 90)

Finally there was one additional element, which was mentioned positively in several interviews. It was the illustrative quality of the timeline, with regards to the rapid building up of workload, compared to being presented with a voice transcript. Sometimes a picture can say more than a thousand words.

The controllers response:

Dekker and Laursen (2007) describe the advantages of combining confidential reporting with investigation approaches that enable operator involvement and apply investigation methods as described above (referred to as second stories after Cook, 1998). The article cites operators for their appreciation of the applied methods and their ability to contribute and learn simultaneously. This research can validate these responses with the reply from the concerned controller after having reviewed the draft report: “This is what I probably expected when I filed the OIR. Furthermore, it really helps me better understand what happened.”

An AAIB obligation to evaluate:

Besides the interviews for this research, recent workshops with the Swiss AAIB have provided the opportunity to exchange views and discuss approaches on how to perform and phrase investigations. Here the AAIB highlighted a legal obligation to evaluate [Bewerten] and stressed that it would violate its obligations by omitting such evaluations.

While the issued concern may be valid it is to be considered that the alternative account by no means avoids evaluations or is value free. What it doesn't do is perform counterfactual judgments in hindsight based on processes of micro matching and cherry picking (see Dekker 2006). Thus, establishing an account of task saturation, complex interactions with limited resources and goal conflicts definitely also includes an evaluation of the investigated occurrence, although from a

different perspective. In this sense it is not given that such an account would conflict with the prescribed objectives of an AAIB investigation. It may only need a re-interpretation of the term “evaluation”.

Interview questions that stretched out too far:

During the interviews it had to be realized that two of the questions were probably trying to capture two large issues and could have become areas of research in their own respect.

One question was about “just culture”. Here only the judicial experts employed by the FOCA had clear positions. This, mainly because the FOCA is dealing actively with the topic and since 2007 has launched its own confidential reporting framework as a just culture initiative. The research interview was however here at risk of becoming a discussion on different positions regarding how to interpret and implement these approaches. Hence the topic had to be abandoned relatively quickly in order not to lose focus on the main research issues and not to confuse the role of researcher with one of an active stakeholder and discussion participant.

In the other interviews “just culture” was described as a societal phenomenon, which had no direct relevance when assessing culpability falling under criminal law. Nevertheless it was also stated that discussions on “just culture” could have a role in shaping the judicial perception of mishaps in high-risk areas such as aviation and healthcare

The second question was about positions on system thinking and organizational breakdown.

The original purpose was to discuss the possibilities of seeing accidents and incidents in modern socio-technical systems as emergent properties of the complex and tightly coupled interactions, which not necessarily were linked to the quality of the concerned processes. A discussion, which

has been held in the human factors domain at least since the publication of Perrow's "Normal Accidents" in 1984.

The question was understood in a completely different manner and all interviewees provided answers that reflected on the possibilities for shifting blame from individuals to organizations. It could be another indication of the linear and deterministic positions that are baked into the judicial field. Probably discussions on non-linear interactions and accident models will remain detached from wider parts of society including the judicial system for some time to come.

A judicial system in transformation:

All the way from the objectives and requirements stated in ICAO Annex 13 and further down to European and local national legislation, calls are made for a clear separation between safety- and judicial investigation. Actually, first steps are also initiated in Switzerland towards such a separation. In 2009 the Canton of Zürich has established a division under the department of public prosecution, which has received the mandate to conduct judicial investigations on occurrences in the aeronautical domain in parallel and independently from the AAIB.

It can probably be helpful in solving a judicial conflict, which was highlighted especially in one of the interviews. It is the conflict between a freedom of information act and the constitutional and human right to avoid self-incrimination - the demand for full and open disclosure to enable progress on safety versus the right to remain silent in the judicial framework. One interviewee stated:

A problem, which has received relatively little attention but is fundamentally problematic, is the inherently differing approach to accountability between an AAIB investigation and

a criminal investigation. The operator in a safety investigation is invited to provide as much information as possible in order to enable progress on safety through a learning process in a framework, which emphasizes that it will not address any questions of legal responsibility or liability. In a judicial investigation the individual has the rights of an accused, which includes a right of non-disclosure - amongst other concerns in order to avoid self-incrimination. This constitutional right is eroded when a potentially full disclosure of a safety investigation is taken as a basis for judicial inquiry.

While the approach of independent parallel investigations is highly welcomed by the AAIB and other stakeholders, who see an abuse of safety documents in the current state, it is possible that the problem of criminalization of human error will not be solved – only displaced. As this research indicates it might be much more about the content of the account than about the structural framework and such judicial divisions will still be dependent on external domain expertise. Along with a growing market, we might very well see the arrival of an increasing number of self proclaimed experts with an even more normative agenda than what can be encountered today and further with the complete absence of the interactions and feedback-loops between AAIB, FOCA and involved stakeholders as it can be found in an AAIB safety investigation. As Dekker (2007) concludes “Unjust responses to failure are almost never the result of bad performance. They are the result of bad relationships” (p. 142) On the consequential strive for improving relationships between a profession and the judicial system he states “Good relationships are about communication, about being clear about expectations and duties, and about learning from each other” (p. 143). One concrete action that could pave the way for improved relationships could then be the achievement of a consensus between profession and judicial system on who and what constitutes an acceptable reference when external safety expertise has to be introduced into independent judicial proceedings. The

consequences of this transformation on reporting culture and perceived justness could easily become an interesting object of research in itself.

The role of the AAIB and its reports:

One topic, which emerged during the creation of this thesis, was the obviously harsh critique with regards to the content of the AAIB report. Did the research eventually fall short of its own ideals and inadvertently identify the real Bad Apple's of this case?

Discussions with reviewers led to anticipating this question amongst potential readers and a consequential need for an answer. The premise for this research – an acknowledgement the local rationality principle - also applies for the AAIB. Hence there is no assumption that these investigators came to work to do a bad job. Also on this level there is a genuine interest in making progress on safety. On the other hand the critique highlights problems concerning the quality of the achieved product when compared to proposals of the scientific literature of the last 20 years both with regards to its potential for progress on safety and, as documented in this research, for its aggravating role in criminalization of human error.

It is not within the scope of this thesis to describe the multitude of factors that have contributed to shape the organization and its reports. It should however be mentioned, that also on this level change can be achieved through an initial improvement of relationships. During the last 18 months intensive discussions on multiple levels have eventually led to the establishment of common investigation workshops where AAIB investigation teams invite representatives from the ANSP's operations and safety department as well as the concerned ATCO association to discuss and finalize the investigation prior to the release of the first draft report.

While Rome was not built in a day, also here a lot of work is needed. Nevertheless the open atmosphere in the discussions and the first results, which will soon reach publication maturity are very promising. These reports are produced with an objective avoid direct counterfactuals and increasingly focus on explanation of performance. Furthermore proposed countermeasures will increasingly be sought in the operators' environment and have protective rather than correctional qualities.

Limitations of this study:

The major weakness of this study is of course its very limited scope as a single case study, with only a total of 6 interviewee's (Including the controller) as first hand source of data. This always opens the question for the legitimacy of going from sample to generalization. Being aware of this limitation, the consequential ambition level of this research as described in the method section was only to explore the possibility of identifying a "sign post" pointing towards an area worth of further study.

With regards to the answers received on the core question of this thesis, - the role of AAIB reports and especially the influence of language in them – nevertheless, the similarity was striking. This should allow to suggest that further studies of this subject probably could fulfill the scientific demand for repeatability and validate the results presented here.

CONCLUSION:

This thesis project set out to seek answers to the following question: "What is the role of AAIB reports, and particularly the influence of judgmental language in them, in how the Swiss judicial system determines individual culpability of ATM operators?"

Fortunately the research could gain access to a series of experts in the judicial system who either had aviation as their special area of expertise or/and had been involved directly in assessing the occurrence, which became the case to study.

The main conclusions address two main areas as reflected in the research question. The first area is about the framework in which safety investigations interface with judicial proceedings. The second area is about language.

Framework:

- Due to its freedom of information act an AAIB report is fully admissible into judicial investigations in Switzerland and as such often functions as primary source of information within the judicial system.
- Due to an obligation to protect the public, AAIB reports of accidents but also of severe incidents will be investigated for possible culpable acts by the public prosecution.
- An AAIB report constitutes a neutral, factual and true account within the judicial system. The structural arrangements of a public expert institution as investigation body and the institutionalized belief in absolute truth within the judicial system imbue an AAIB report with an ontological status.

Language:

The research shows how application of different kinds of language can create differences in the creation of meaning, here with regards to culpability of individual operators, and how this may create different repertoires of responses to adverse outcomes. The research results seem to confirm what K. Burke has phrased so elegantly:

Not only does the nature of our terms affect the nature of our observations, in the sense that the terms direct the attention to one field rather than to another. Also, many of the “observations” are but implications of the particular terminology in terms of which the observations are made. In brief, much that we take as observation about “reality” may be but the spinning out of possibilities implicit in our particular choice of terms. (Burke, 1989, p. 116)

An account, if provided by an institution like the AAIB, that avoids counterfactual reasoning and exchanges indignation with explanation could with high certainty reduce the likelihood that a judicial system would respond with criminal investigations in what is often referred to as criminalization of human error.

Summing up, language should be seen as an important ingredient in how individuals and institutions respond to occurrences. Reactions to failure that identify culpable acts are more likely to emerge when the account of the individuals actions is embedded in counterfactuals and judgmental statements and reduced or even absent when the same events are described with an explanatory language that provides accounts of why actions were rational at the time.

The problem of going from sample to generalization of course limits the validity of these arguments and more research would be needed to confirm what this research has indicated.

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Final Report of the Aircraft Accident Investigation Bureau

concerning the incident (Airprox)

between DLH3703 and KLM1931

on 26 April 2004

at Geneva Airport

HISTORY

On Monday 26 April 2004, at 13:09, aircraft DLH3703, type ATR45, taxied onto taxiway GOLF for a departure from runway 05 and called on the Geneva Control Tower frequency.

At 13:10 UTC, aircraft KLM1931, type Boeing 737, called the Control Tower and reported that it was established on final approach on the ILS of runway 05.

An aircraft type Avro RJ85, flight SWR607N, was on short final approach on the ILS of runway 05 and was in the landing phase.

The aerodrome controller asked the pilot of aircraft DLH3703 if he was ready for an immediate departure, to which the pilot responded in the negative.

The traffic load being handled by the aerodrome controller was heavy. Separation between aircraft flying according visual flight rules (VFR) in the control area obliged him to transmit essential traffic information.

At 13:11, the aerodrome controller cleared aircraft SWR607N to land. At this moment, the pilot of aircraft DLH3703 stated that he was ready for take-off.

At 13:12, the aerodrome controller informed the pilot of aircraft DLH3703 that he could expect a departure behind the second landing aircraft and instructed him to hold short of the runway.

The second aircraft which the aerodrome controller indicated was landing was flight KLM1931, the Boeing 737 which was then 6.5 NM from the threshold of runway 05.

At 13:13, aircraft SWR607N landed and, during the aircraft's deceleration phase before it vacated the runway, the aerodrome controller did not notice that aircraft DLH3703 had made an incursion onto runway 05 and was lining up for take-off.

For more than a minute, the aerodrome controller was busy handling VFR traffic in the control area and, at 13:14, cleared the pilot of aircraft KLM1931 to land.

The pilot of aircraft KLM1931 noticed aircraft DLH3703 which was on the runway and was expecting it to take off immediately. At about 300 FT above ground level, as the aircraft was still in the holding position on the runway, he decided to go around.

About 10 seconds after hearing the landing clearance given to aircraft KLM1931, the pilot of aircraft DLH3703 called the Control Tower and confirmed that he was on the runway.

The aerodrome controller's reaction was virtually immediate; he instructed the pilot of aircraft KLM1931 to go around.

The aircraft initiated the go around when it was about 0.5 NM at an altitude of 1700 FT.

The aerodrome controller informed the pilot of aircraft DLH3703 that he would submit an incident report.

FINDINGS

- Weather: Geneva, bulletin at 12:50 UTC
Wind 040 degrees 7 knots, variable between 010 and 080 degrees
Visibility: 10 KM
Cloud: few at 5000 FT
Temperature: + 15° C
QNH 1016 hPa
NOSIG (no significant change).
- Runway in operation: 05.
- Grass runway closed to VFR traffic.
- The aerodrome controller was in possession of a valid licence.
- All radio communications on the TWR frequency 118.7 MHz between the pilots of flights KLM1931, DLH3703 and the aerodrome controller took place in English.
- 11 aircraft were controlled on frequency 118.7 MHz over an interval of 7 minutes and 22 seconds; 3 departures, 5 arrivals and 3 VFR.
- At 13:09:55, the pilot of aircraft DLH3703 called the Control Tower on frequency 118.7 MHz, reporting that he would call back when ready to take off.
- At 13:10:43, the pilot of aircraft KLM1931 called the Control Tower on frequency 118.7 MHz, reporting that he was established on the runway 05 ILS.
- At 13:10:51, the aerodrome controller asked the pilot of aircraft DLH3703 if he was ready for an immediate departure.
- At 13:10:54, the pilot answered in the negative.
- At 13:11:24, the aerodrome controller cleared aircraft SWR607N, an Avro RJ85, to land.
- At 13:11:58, the pilot of aircraft DLH3703 called the Control Tower, reporting that he was ready to take off.
- At 13:12:30, the aerodrome controller acknowledged receipt of the message and instructed the pilot of aircraft DLH3703 to hold short of the runway, informing him that he could expect to take off after the second landing aircraft.
- The aerodrome controller did not issue a conditional departure clearance to the pilot of aircraft DLH3703.
- At 13:12:33, the pilot of aircraft DLH3703 acknowledged receipt of the message using the term "*ROGER*".
- No conditional clearance for line-up was delivered to the pilot of aircraft DLH3703
- At 13:13:09, according to the radar recording, aircraft SWR607N crossed the threshold of runway 05.
- According to the report of the eurowings company, the pilot of aircraft DLH3703 declared that he had been cleared by the Control Tower to line up behind the traffic following the landing. He had lined up behind the Avro RJ85 after it cleared the threshold of runway 05. He then heard the Control Tower issue landing clearance to aircraft KLM 1931 and immediately informed the Control Tower that he was on the runway in take-off position.

All times indicated in this report are in UTC format

- Between 13:13:11 and 13:14:15, the aerodrome controller handled 15 bilateral radio communications, mainly with aircraft under VFR conditions.
- At 13:14:15, the aerodrome controller cleared aircraft KLM1931 to land.
- Aircraft KLM1931 was at a distance of 1.5 NM and an altitude of 2000FT.
- At 13:14:20, the pilot of aircraft KLM1931 read back this clearance.
- At 13:14:22, the aerodrome controller handed over aircraft SWR607N to the APRON frequency 121.75 MHz.
- At 13:14:30, the pilot of aircraft DLH3703 stated that he was on the runway.
- At 13:14:36, the aerodrome controller instructed the pilot of aircraft KLM1931 to go around and climb to an altitude of 7000 FT in the direction of Saint-Prex VOR, without giving him information about the traffic on the runway.
- At 13:14:42, the pilot of aircraft KLM1931 read back this message at a distance of 0.75 NM from the touch-down point on runway 05.
- According to his report, the pilot of aircraft KLM1931 declared that he had been cleared to land when he was at about 1000 FT on the ILS, that he had observed an aircraft lining up on the runway, expecting it to take off immediately. At a height of about 300 FT he decided to go around, given that the aircraft was still in the holding position. The Control Tower instructed him to go around at the same time.

ANALYSIS

Aircraft DLH 3703:

The pilot of the aircraft had received the following clearance: "*hold short, expect departure behind the second landing traffic*". The pilot acknowledged receipt of the message by saying "*roger, DLH3703*".

The aerodrome controller therefore instructed the pilot of aircraft DLH3703 to hold short of the runway and informed him that he could expect to depart behind the second landing aircraft.

The aerodrome controller did not issue a conditional departure clearance to the pilot of aircraft DLH3703. However, the instruction to hold short of the runway must always be read back by the pilot. **The term "roger" is insufficient and does not constitute a read-back.**

According to the pilot's report, he understood the clearance in the following way: "hold short of runway and line up on runway 05 behind next landing". This conditional clearance should have been read back; this did not happen. The crew therefore obviously did not understand the clearance and did not concern themselves with finding out if it was correct.

When the aircraft made its unauthorised incursion onto the runway, aircraft KLM1931 was at a distance of between 3 and 4 NM on its final ILS approach at an altitude of about 2800 FT. **Since the visibility conditions were good, the crew of DLH3703 should have ensured visually that the final approach was free while lining up on the runway.** Moreover, the TCAS is a good means of detecting any traffic on approach. Apparently, none of these means was used to avoid this incursion.

The crew became aware of the problem only when the Control Tower issued the landing clearance to aircraft KLM1931. They reacted immediately by drawing the attention of the Control Tower, surprised that the latter was issuing such a clearance while the runway was occupied.

Aircraft KLM 1931:

When aircraft DLH3703 made its unauthorised entry onto runway 05, aircraft KLM1931 was at a distance of between 3 and 4 NM on its final ILS approach at an altitude of about 2800 FT. The crew of KLM1931 might therefore have thought it was an immediate departure, even though it had not received any traffic information from the Control Tower.

The pilot stated that he had been cleared to land when he was at about 1000 FT on the ILS. According to the radar recordings, the aircraft was 1.5 NM distant at an altitude of 2000 FT. It is surprising that the pilot did not inform the Control Tower at this time that he was not able to comply with the landing clearance because the runway was obstructed by an aircraft.

Again according to the pilot's statements, it was at about 300 FT above ground level that the crew of KLM1931 decided to go around, given that the aircraft was still in the holding position on the runway. He would have received the go-around instruction from the Control Tower at the same time.

The aerodrome controller:

The traffic load at the time of the incident was heavy. Between the landing of aircraft SWR607N, behind which aircraft DLH3703 lined up without clearance, and the landing clearance given to aircraft KLM1931, the aerodrome controller's attention was distracted by a VFR conflict which required radar observation (head down).

The aerodrome controller did not visually monitor the application of the clearance issued to aircraft DLH3703 and gave a landing clearance without confirming visually that the runway was clear.

Since the instruction to hold short of the runway had not been read back, the controller had not received any assurance that the pilot of aircraft DLH3703 was going to carry out this instruction. From that point onward, the risk of an incursion became possible.

The aerodrome controller became aware of the problem only at the last moment, when the pilot of aircraft DLH3703 informed him that he was on the runway (head up).

After becoming aware of the conflict, he issued the go-around instruction.

According to his statements, the aerodrome controller would have appreciated assistance from a TWR coordinator. His presence would have provided one means of detecting the error.

The TWR control unit consists of 3 control positions, ADC, TRC and GND.

During periods of heavy traffic loads, the aerodrome controller is assisted by the TWR coordinator (TRC), whose tasks are clearly defined in the Geneva ATM manual. Apart from assisting the aerodrome controller, his tasks consist, among others, of ensuring coordinations, transmitting landing, departure and go-around times and managing the auxiliary control screens and the control strips.

Since the concept of heavy traffic load is interpreted in different ways, the TRC control station is not systematically occupied.

CAUSE

The incident is due to the following facts:

- the crew of aircraft DLH3703 did not read back the clearance which they did not understand,
- the aerodrome controller did not ensure that the clearance he had issued had been understood,
- a landing clearance was issued without a prior visual check of the runway by the aerodrome controller.

Factor affecting the evolution of the incident:

Absence of assistance for the aerodrome controller in a situation of heavy traffic load.

SAFETY RECOMMENDATION NO. 358 - 359

Safety deficit

The Geneva airport aerodrome controller allowed a commercial aircraft to land without noticing that the runway was occupied. The crew of the aircraft occupying the runway did not read back and did not understand the instruction from the control tower.

Safety recommendation

358. The Federal Office of Civil Aviation should require that all intersections and ends of runways be equipped with stop bars and that these should be activated during all meteorological conditions during the airport's hours of activity.

359. The Federal Office of Civil Aviation should study the possibility of introducing courses for improving English phraseology during the refresher courses required by JAR standards.

Berne, 12 May 2005

Aircraft Accident Investigation Bureau

THIS REPORT SERVES EXCLUSIVELY TO PREVENT ACCIDENTS. THE LEGAL ASSESSMENT OF ACCIDENT/INCIDENT CAUSES AND CIRCUMSTANCES IS NO CONCERN OF THE INCIDENT INVESTIGATION (ART. 24 OF THE AIR NAVIGATION LAW)

All times indicated in this report are in UTC format

**TRANSCRIPT OF TELEPHONY
OR RADIOTELEPHONY COMMUNICATION TAPE-RECORDINGS**

Investigation into the **incident** that occurred on **26.04.2004**

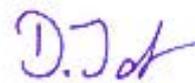
- Subject of transcript:	DLH3703 / KLM1931
- Centre concerned:	Swiss Radar Area West
- Designation of unit:	Terminal Control, Geneva Tower
- Frequency / Channel:	118.7 MHz
- Date and period (UTC) covered by attached extract:	26.04.2004 13:09 - 13:17 UTC
- Date of transcript:	12 May 2004
- Name of official in charge of transcription:	Didier JAVET

- Certificate by official in charge of transcription:

I hereby certify:

- That the accompanying transcript of the telephony or radiotelephony communication tape-recordings, retained at the present time in the premises of the Analysis Department, has been made, examined and checked by me.
- That no changes have been made to the entries in columns 2, 3 and 4, which contain only clearly understood indications in their original form.

Geneva, 12 May 2004


Didier JAVET

Abbreviations

Sector Designation of sector

TWR - Terminal Control, Geneva Tower

<u>Aircraft</u>	-	<u>Callsign</u>	<u>Type of acft</u>	<u>Flight rules</u>	<u>ADEP</u>	-	<u>ADES</u>
3703	-	Lufthansa 3703	AT45	IFR	LSGG	-	EDDL
DCY	-	D – IPSY	BE20	IFR	EDSB	-	LSGG
1931	-	KLM 1931	B733	IFR	EHAM	-	LSGG
607N	-	Swiss 607N	RJ85	IFR	LFPG	-	LSGG
FOY	-	F – GTOY	AS50	VFR	LFLI	-	????
986	-	Topswiss 986	A319	IFR	EGNX	-	LSGG
HHW	-	HB – CHW	C172	VFR	????	-	LSGG
HNJ	-	HB - ?NJ	????	VFR	????	-	????
9KW	-	Lufthansa 9KW	B735	IFR	LSGG	-	EDDF
340P	-	Sky Share 340P	H25B	IFR	EGKB	-	LSGG
FGT	-	F - GGGT	C550	IFR	LSGG	-	LFRD

OGED / 12 May 2004

TRANSCRIPT SHEET

Occurrence: DLH3703 / KLM1931 of 26.04.2004



To Col.1	From Col.2	Time Col.3	Communications Col.4	Observations Col.5
Frequency: 118.7 MHz, Geneva Tower				
TWR	3703	13:09:55	Tower, good evening, Lufthansa three seven zero three.	
3703	TWR	58	Lufthansa three seven zero three, good afternoon, report ready.	
TWR	3703	13:10:01	Call you ready, Lufthansa three seven zero three.	
DCY	TWR	16	Sierra Yankee, Ground, one two one decimal six seven, tschüss.	
TWR	DCY	20	XXXXXX, bye-bye, Delta Sierra Yankee.	Could be "Six one two seven"
TWR	1931	43	Tower, good day, KLM one nine three one, established on the ILS zero five.	
1931	TWR	47	KLM one nine three one, good afternoon, roger.	
3703	TWR	51	Lufthansa three seven zero three, ready for rapid departure?	
TWR	3703	54	Heu... negative, Lufthansa three seven zero three.	
607N	TWR	13:11:24	Swiss six zero seven November, the wind zero five zero degrees, three knots, runway zero five, cleared to land.	
TWR	607N	30	Cleared to land zero five, Swiss six zero seven November.	
TWR	FOY	38	Genève d'hélicoptère Fox Oscar Yankee, bonjour.	
FOY	TWR	42	Un instant, je vous rappelle.	
TWR	3703	58	Ready now, Lufthansa three seven zero three.	
3703	TWR	13:12:21	Station calling Geneva, say again.	
TWR	3703	27	Lufthansa three seven zero three, fully ready now.	
3703	TWR	30	Roger, hold short, expect Departure behind the second landing traffic.	
TWR	3703	33	Roger, Lufthansa three seven zero three.	

Signature of person in charge of transcription : 

TRANSCRIPT SHEET

Occurrence: DLH3703 / KLM1931 of 26.04.2004



To Col.1	From Col.2	Time Col.3	Communications Col.4	Observations Col.5
FOY	TWR	13:12:35	Et l'hélicoptère en français qui appelait la Tour, vous pouvez y aller?	
TWR	FOY	37	Oui, bonjour..., un Ecureuil, Fox Golf Tango Oscar Yankee, on vient de décoller d'Annemasse, on aimerait faire un transit par Sierra Echo et... Echo si c'était possible, à trois mille pieds QNH.	
FOY	TWR	48	Tout en restant en dehors de la CTR?	
TWR	FOY	51	Heu... on pourrait, on aimerait passer par les points Sierra Echo et Echo si c'était possible.	
FOY	TWR	56	Oscar Yankee, alors c'est approuvé, à maximum trois mille cinq cents pieds, Sierra Echo, rappelez Sierra Echo.	
TWR	FOY	13:13:03	On rappelle Sierra Echo, maximum trois milles cinq cents pieds..., Oscar Yankee.	
TWR	986	07	Genève Tour, bonjour, Topswiss nine eight six, established on the ILS zero five.	
986	TWR	11	Topswiss niner eight six, bonjour, report three miles.	
TWR	986	14	Report three miles, nine eight six.	
TWR	HHW	21	Geneva Tower, Hotel Bravo Charlie Hotel Whiskey.	
HHW	TWR	24	Hotel Bravo Charlie Hotel Whiskey, good afternoon.	
TWR	HHW	27	Hotel Hotel Whiskey..., approaching Echo, three thousand five hundred feet, for landing, information Alfa.	
HHW	TWR	32	Hotel Hotel Whiskey, roger, report... Sierra Echo, runway zero five concrete, QNH one zero one six.	
TWR	HHW	39	Report Sierra Echo..., QNH one zero one six..., runway zero five concrete, Hotel Hotel Whiskey.	
HHW	TWR	47	Correct, look out for a traffic, single engine aircraft..., opposite direction, approaching Echo.	
TWR	HHW	53	XXXXX.	Noise of microphone
HNJ	TWR	56	Hotel November Juliett, regarde pour un trafic mono-moteur qui s'approche d'Echo en direction opposée.	

Signature of person in charge of transcription : 

TRANSCRIPT SHEET

Occurrence: DLH3703 / KLM1931 of 26.04.2004



To Col.1	From Col.2	Time Col.3	Communications Col.4	Observations Col.5
TWR	HNJ	13:14:00	Hotel November Juliett, compris, je descends vers trois mille pieds et j'arrive à Echo.	
HNJ	TWR	05	Reçu, tu procèdes November?	
TWR	HNJ	07	Je... fais route, affirm, par Gland, Novembre ... en dessous de la TMA.	
HNJ	TWR	11	Reçu, rappelle November.	
TWR	HNJ	13	Hotel November Juliett, rappelle November.	
1931	TWR	15	<i>KLM one nine three one, the wind zero four zero degrees, six knots, runway zero five, cleared to land.</i>	
TWR	1931	20	<i>Cleared to land zero five, KLM one nine three one.</i>	
607N	TWR	22	Swiss six zero seven November, one two one seven five, au revoir.	No reply
TWR	9KW	26	Tower, bonjour, Lufthansa nine Kilo Whiskey.	No reply
TWR	3703	30	Heu... Lufthansa three seven zero three, just to confirm, we are on the runway.	
1931	TWR	36	<i>KLM one nine three one, go around, I say again, go around, proceed Saint-Prex, climb to seven thousand feet, QNH one zero one six.</i>	
TWR	1931	42	<i>Yes, go around, ?????? climb to seven thousand, KLM one nine three one.</i>	Unreadable
3703	TWR	47	Lufthansa three seven zero three, you were never allowed to line up!	
TWR	3703	54	We had a line up clearance, Lufthansa three seven zero three.	
3703	TWR	57	You did not, hold position.	
TWR	3703	13:15:00	We were cleared to line up behind the landing, heu... Swiss.	
3703	TWR	04	Negative, I said "expect departure behind second landing".	
TWR	3703	11	Okay, we'll check that, Lufthansa three seven zero three.	

Signature of person in charge of transcription : 

5 - 7

TRANSCRIPT SHEET

Occurrence: DLH3703 / KLM1931 of 26.04.2004



To Col.1	From Col.2	Time Col.3	Communications Col.4	Observations Col.5
3703	TWR	13:15:14	So will I.	
TWR	340P	24	Tower, bonjour, Sky Share three four zero Papa, twelve miles final.	No reply
TWR	FGT	35	Le.....	
TWR	FGT	38	Genève Tour, Fox trois fois Golf Tango, bonjour.	
FGT	TWR	42	Fox trois fois Golf Tango, bonjour, je vous rappelle.	
TWR	FGT	42	Reçu, Golf Tango.	
1931	TWR	53	<i>KLM one nine three one, Departure, Arrival, one three one, correction, one three six decimal two five, goodbye.</i>	
TWR	1931	58	<i>One three six two five, bye-bye, KLM one nine three one.</i>	
3703	TWR	13:16:03	Lufthansa three seven zero three, the wind zero five zero degrees, four knots, runway zero five, cleared take-off.	
TWR	3703	07	Cleared for take-off zero five, Lufthansa three seven zero three.	
FOY	TWR	11	Oscar Yankee, vous restez en dehors de la CTR, procédez Echo.	
TWR	FOY	15	Oui, Oscar Yankee, on part en direction d'Echo.	
TWR	340P	22	Tower, good day, Sky Share three four zero Papa is with you, nine miles final.	
340P	TWR	27	Sky Share three four zero Papa, bonjour, continue approach.	
TWR	986	40	Two miles, Topswiss... nine eight six.	
986	TWR	43	Topswiss niner eight six, the wind zero six zero degrees five knots, runway zero five, clear to land.	
TWR	986	47	Clear to land zero five, Topswiss nine eight six.	
TWR	9KW	52	Tower, bonjour, Lufthansa nine Kilo Whiskey, ready and holding short zero five.	

Signature of person
in charge of transcription : 

6 - 7

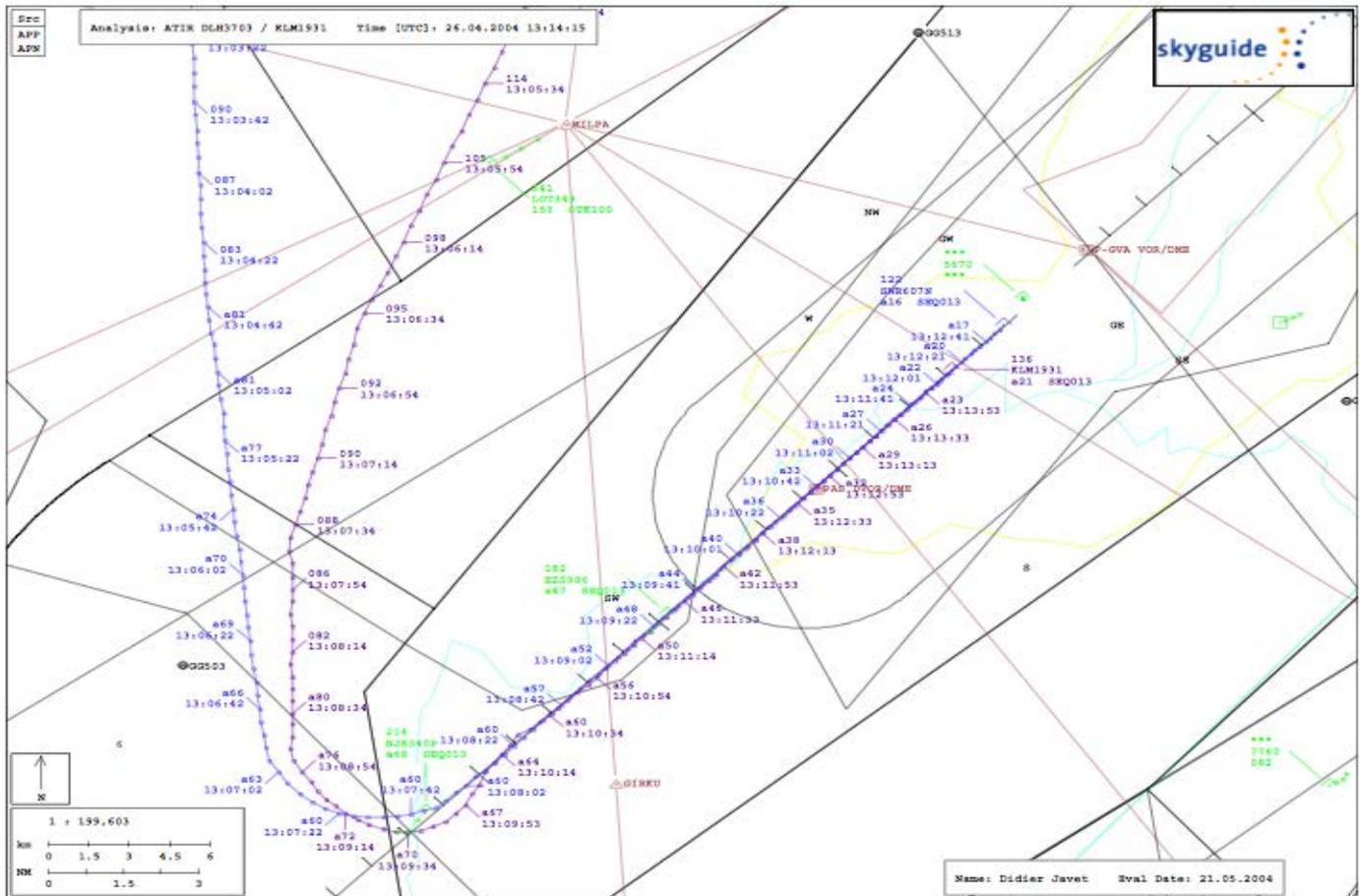


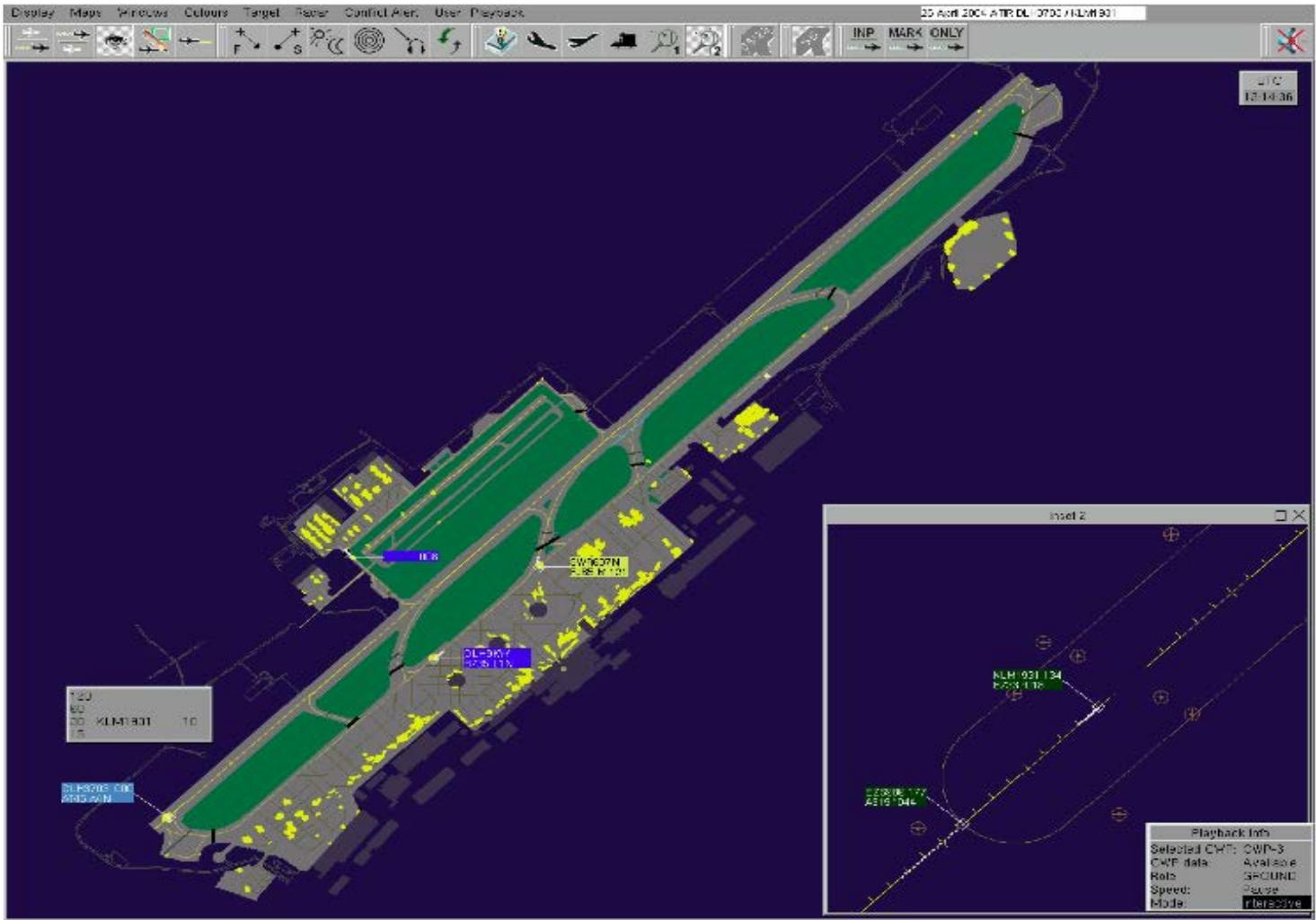
TRANSCRIPT SHEET

Occurrence: DLH3703 / KLM1931 of 26.04.2004

To Col.1	From Col.2	Time Col.3	Communications Col.4	Observations Col.5
9KW	TWR	13:16:58	Lufthansa niner Kilo Whiskey, bonjour, hold short.	
TWR	9KW	13:17:01	Holding short, Lufthansa nine Kilo Whiskey.	
3703	TWR	07	Lufthansa three seven zero three, be advised that we'll have to file a report.	
TWR	3703	12	That's copied.	
3703	TWR	14	Three seven zero three, contact Departure, one two one decimal three, goodbye.	
TWR	3703	17	One two one decimal three, Lufthansa three seven ... heu... zero three and sorry XXXXX.	Could be "again"

Signature of person
in charge of transcription :





Annex B: Alternative Investigation Report

Alternative Investigation Report

On Incident between DLH3703 and KLM1931

At International Airport of Geneva 26.04.2004

Disclaimer:

This report is only produced for the scope of a scientific research in connection with a master thesis by Marcian Tessin at the University of Lund, Sweden. Further the investigation will concentrate on the ATM domain exclusively.

Factual Information:

The incident took place at the Airport of Geneva on Monday the 26. April 2004 at 13:15 UTC (Universal Time Coordinated), which in this case means 15:15 local time. To be consistent with the information in the AAIB report and avoid confusion all time references here will be made in the UTC format. The Airport of Geneva has one concrete runway (RWY) and a small parallel grass RWY. The runway can be used in both directions and the direction in use is indicated by the runway's name. Further the runway is connected to the apron and gates via a taxiway-system that is designated with letters. This afternoon the RWY in use was 05, which indicates its magnetic orientation to the northeast (heading 050°).

At 13:09 a Lufthansa (DLH) Flight 3703 was getting ready for departure and had commenced rolling (taxiing) on taxiway G and called the tower on the designated frequency. At this time a Swiss (SWR) flight 607N was on short final for RWY 05 and at 13:10 a KLM flight 1931 called the tower controller (called TWR during the remainder of this section) and reported that it was established on the Instrument Landing System (ILS) for the final approach to RWY 05. The TWR asked DLH3703 if he was ready for an immediate departure, to which the DLH responded in the negative. While these aircraft were operating under Instrument Flight Rules (IFR), the TWR was also handling several aircraft flying under Visual Flight Rules (VFR). While these mostly consist of smaller privately operated aircraft and are not subject to the same separation criteria, the airspace in the vicinity of the airport is classified in a manner that necessitates an entry- and crossing- clearance via defined VFR routes in order to avoid that such flights conflict with departing and landing traffic. During the next three to four minutes a helicopter and two small aircraft called the TWR to obtain such clearances, while the controller was simultaneously handling the IFR traffic. At 13:11 the TWR cleared SWR607N to land. Shortly after DLH3703 reported ready for departure. The TWR told the DLH3703 to hold short [of the RWY] and informed the pilot that he could expect line up after the second landing aircraft. At 13:13 SWR607N landed. While this aircraft vacated the runway and the TWR was giving traffic information to potentially conflicting VFR traffic, DLH3703 entered the RWY and lined up for take-off. At 13:14 the TWR cleared KLM1931 to land. Approximately 10 seconds after this clearance DLH3703 informed the TWR that he was on the RWY. The TWR responded by immediately clearing KLM1931 to go around. KLM1931 initiated a go around at about 0.5 Nautical Miles (NM) final at an altitude of 1700 Feet (FT)/AMSL (Above Mean Sea Level).

Subsequently DLH3703 was informed that no clearance to enter the runway had been given and was eventually cleared for take-off. Before being transferred to the departure clearance DLH3703 was informed about the TWR controller's intention to file a report. KLM1931 received a second line up by the approach controller after which he landed uneventfully.

Analysis:

The controller who was working at the time of the incident performed multiple functions that varied throughout the rostering. He was licensed to perform operational tasks as tower controller, radar approach controller and supervisor. Further he participated in formation of new controllers as instructor in the simulator, classroom instruction including TRM (Team Resource Management) as well as on the job training.

The day of the incident, the controller started work at 10:00 on a tower supervisor shift, which lasted till 17:00. The tower supervisor during the shift handles a series of supervisory tasks from a separate position in the tower. The tasks may also include administrative tasks that may be partially performed in offices below the tower cap. Further this particular tower shift included a one-hour session as tower controller in order to facilitate a break relieve for the regular controller shifts. During this session another person was responsible for the supervisory tasks. The controller could not recall whether this supervisor was present in the tower cap during the minutes around the occurrence.

The handling of traffic that day was characterized by good visibility with a number of VFR movements as a consequence. Two particular problems had to be integrated in traffic management that day. The grass runway of the airport was closed, which meant that small VFR aircraft had to be integrated into the arriving and departing IFR traffic. This task was further complicated by a wind shear situation in the vicinity of the airport which meant that traffic landing on RWY 05 would have 3 to 5 kts headwind upon landing but 15 kts tailwind on 10 to 15 NM final. For this reason considerations to change to the opposite runway were considered and discussed with the approach sector during the day but eventually dismissed due to the consequential tailwind landing. Besides the tasks connected directly to the handling of traffic by monitoring and voice communication, the controller also has to enter landing- and departure times into a computer and coordinate details with approach or apron control.

When DLH3703 first called the tower, the controller immediately considered the possibilities for integrating the departure into the landing sequence. At this time SWR607N and KLM1931 were established on the final approach. Since DLH3703 was already close to the holding position and there still would be sufficient spacing to depart in front of SWR607N the controller inquired about the possibility for a rapid departure. Since this was answered with a negative, the controller evaluated the subsequent possibilities. The KLM1931 was still flying with a relatively high speed - partially due to the windshear - and as a consequence, closing in on the preceding SWR607N. The first possible line up would be after the landing of the KLM1931. The controller then cleared SWR607N to land. Immediately after, a VFR helicopter made its initial call on the frequency.

The controller was at this time temporarily occupied performing other tasks and hence asked the helicopter to stand by.

While the flightplans of IFR traffic are known and already exist in the traffic management systems, the details regarding VFR traffic requesting to cross the CTR/TMA are unknown to the controller and have to be obtained through communication on the frequency and manually producing a flight progress strip or writing the details down on a piece of paper.

As the controller was preparing the reception of these details for the helicopter, DLH3703 reported ready. The controller saw the aircraft standing at the holding point and replied with "Roger, hold short, expect departure behind the second landing traffic", which was read back with "Roger, DLH3703" by the pilot. The controller stated that he had the intention to clarify to the DLH pilots that they should remain at the current position and additionally provide them with a service-information about when they could expect line up.

While the handling of other tasks became more pressing with the call of the VFR traffic, the communication with the pilots was also commensurate with the controllers understanding and expectations of the situation. The communication did not include any new clearance since DLH3703 had never been cleared to enter the runway. Hence the hold short had the function

of a confirmation of the prevailing restrictions and additionally the pilots were informed about what to expect next.

Subsequently the VFR details were obtained and a routing clearance via defined VFR reporting points given. Immediately after, EZS986 made its initial call on final runway 05. A few seconds later the VFR flight HBCHW called on the frequency for entry clearance and requesting to land at the airport. Since this aircraft had departed from Geneva its details were known to the controller but its integration for landing on the concrete runway had to be considered. HBCHW was approaching point E from the east and the controller realized that it was on conflicting course at the same altitude (altitude derived from the clearance on the strips) with HBxNJ, which was routing from points SE to E. The controller hence issued traffic information to the two aircraft, in English for HHW and in French for HNJ.

The tracking for which aircraft is handled in which language is achieved by stripmarking (F for French R/T).

The attention was hence rapidly shifting between strips and radar while providing traffic information. According to the controller, he then went on to perform a visual check of the runway prior to giving the landing clearance to KLM1931. He stated that this was an integral part of the workflow that was never skipped and that it was definitely performed in this case since the controller needed absolute assurance that SWR607N had fully vacated the runway and because he wanted to verify the position of the KLM1931.

The DLH3703, which had entered the runway, was not detected. SWR607N was then transferred to the apron and immediately after, DLH9KW called in preparing for departure.

The controller stated not replying to DLH9KW because he was starting to realize the developing conflict. This realization was confirmed by DLH3703 informing the TWR about its position on the runway. The controller immediately issued a go around clearance for KLM1931 who responded accordingly. After a short exchange with DLH3703 on the differing understanding of the situation, the aircraft departed as planned.

The controller continued to work on the position as scheduled and subsequently filed an operational internal report (OIR) to inform about the occurrence.

Conditional clearances and closing the loop through read-back:

In ATC (Air Traffic Control) standard phraseology the possibility for a conditional clearance is given but also very prescriptive in the way it needs to be executed. In this case a conditional line up clearance, as understood by the aircrew, would have been. “DLH3703, behind landing Swiss jumbolino [name of the aircraft type and company optional] line up behind and wait”. This should then be fully read back by the pilot in order to assure that the clearance was correctly received and acknowledged by the controller with “correct”

In the given clearance the “hold short” constitutes a clearance while the remainder is information for which no read-back is required. The controllers at the airport of Geneva are further instructed to never give conditional line up clearances behind a second landing aircraft, because the risk for a false interpretation of the sequence is too high. In this context

the clearance and the read-back was commensurate with the expectations of the controller. The clearance hold short was simply a reiteration of the current clearance limit, which was the holding point where the aircraft had already stopped prior to the R/T exchange. In the given situation the controller did not question the read-back for two reasons. The workload had started to increase and the VFR helicopter was still standing by for its initial call. Further the controller stated that he would have expected a completely different type of read-back if the crew of DLH3703 had perceived the communication as a conditional line up clearance.

Two minutes later the transfer of SWR607N to the apron frequency was not read back either. Again the workload did not allow to prompt the crew for a read-back and while this happens regularly, the controllers have developed a coping strategy to verify the transfer. The aircraft about to vacate the runway is not allowed to enter the apron without a clearance. If it can be visually confirmed that the aircraft is taxiing further, this is taken as positive indication for the achieved transfer. Should by any means the aircraft enter the apron without having established contact, the apron would call the tower controller immediately.

Traffic load vs. task load:

During the period between 13:09:00 and 13:17:30 six IFR and four VFR flights were handled by the controller who at the time was performing all tower operations alone. Because the number of flights provides limited information about the actual workload situation, the investigation has constructed a timeline covering mainly the R/T communication. It should be noted that other tasks at this time included manually producing flight progress strips for 2 VFR flights, entering landing and departure times for the handled IFR traffic and at least one telephone coordination. Unfortunately the recording of the phone line was not retrieved, which is why the exact data could not be entered into the timeline.

However already the R/T load illustrates the fluctuation of the task load and shows a peak between 13:12:20 and 13:15:10 where the frequency was practically used without interruption. It is also during this period that essential traffic information had to be given to conflicting VFR traffic. The excessive workload and the additional fact that also within this period the runway incursion by DLH3703 was not detected, strongly indicate that the controller was momentarily task saturated.

Human performance limitations:

The timeline supports the finding that the controller was temporarily task saturated. One of the known consequences of such stress is tunneling – “The tendency to see an increasingly narrow portion of one’s operating environment” (Dekker, 2006, p.142). It can be described as an involuntary coping mechanism that allows the operator to keep a robust picture of a limited set of information at the sacrifice of other sources. Under such conditions, audible as well as visual information can remain undetected.

Staffing:

The incident occurred while the controller was operating the tower on his own. This is considered normal practice in periods with low traffic. As this incident demonstrates, there is however no symmetry between traffic load and workload. Further, on days with VMC

conditions, it is impossible to anticipate the additional workload that may be created by VFR traffic.

According to the official statistics of AIG (Aéroport Internationale de Geneve) the total number of movements (starts and landings not VFR crossings) in 2003 was 163.760 and almost 8.1 million passengers were handled.

The working unit has had problems with understaffing for years and the rostering has been optimized to a point where the supervisor provides the break relief for the operational controllers. A second supervisor performs the supervisory duties but is not necessarily present in the tower at all times, which hampers the ability for the controller to rapidly ask for help.

New technology:

Two types of technological equipment, which could have helped avoid or detect the incident, will shortly be discussed here.

Stop bars that are lit at the holding positions can provide an additional visual aid for pilots to verify their clearance limit. While such bars in certain conditions still can create misunderstandings that will not be discussed here, it would most probably have helped to prevent the aircrew from entering the runway prematurely.

The airport of Geneva has implemented surface movement radar called SAMAX, which will become operational in October 2004. (Note: the attached image in the AAIB report is from a period where the system was in a test phase) This radar can be equipped with a monitoring aid called RIMCAS that provides an alarm when an object enters the runway without a clearance. While also such systems are not without deficiencies it is most likely that the controller would have been alarmed immediately when DLH307 entered the runway.

[In 2010 while the case study is performed, the stop bars have been in operation for several years and the RIMCAS has been implemented in Geneva since December 2009]

Safety nets:

While no technological safety nets were in place to assist the detection of the emerging situation, the problem was detected by the DLH307 crews monitoring of the frequency and immediate response to the landing clearance as well as by the crew of the KLM1931 who had visual contact with the aircraft on the runway and was about to autonomously initiate a go around simultaneously with the controllers clearance.

Conclusion:

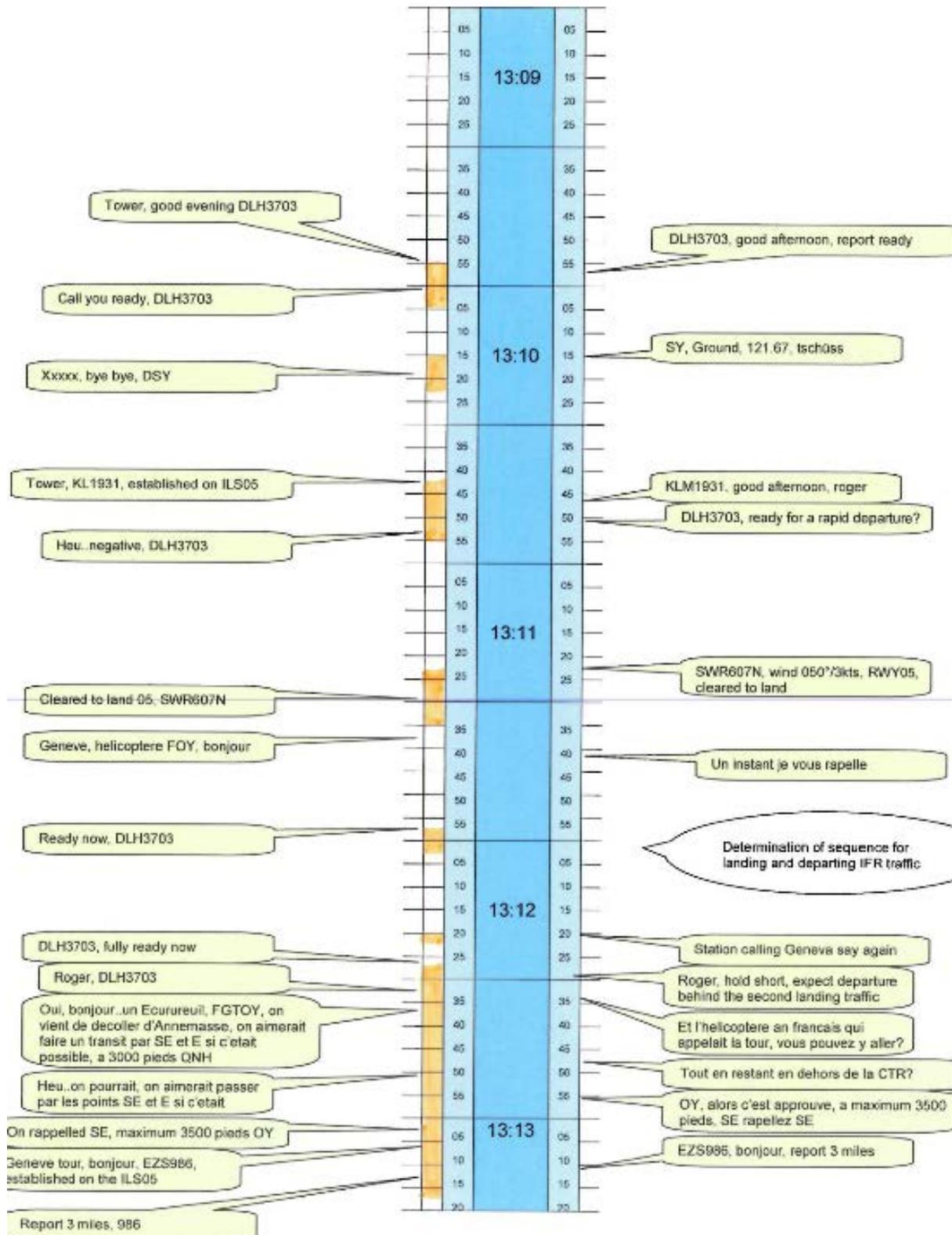
In a position with minimal staffing the controller had to handle traffic under circumstances which added to the complexity such as wind shear on final and unavailability of the grass strip in combination with VMC conditions and the consequential increased VFR activity. A communication breakdown in combination with a temporary task saturation led to an undetected runway incursion. The human redundancy of the aircrews and the subsequently immediate response of the controller helped to reduce a risk of collision.

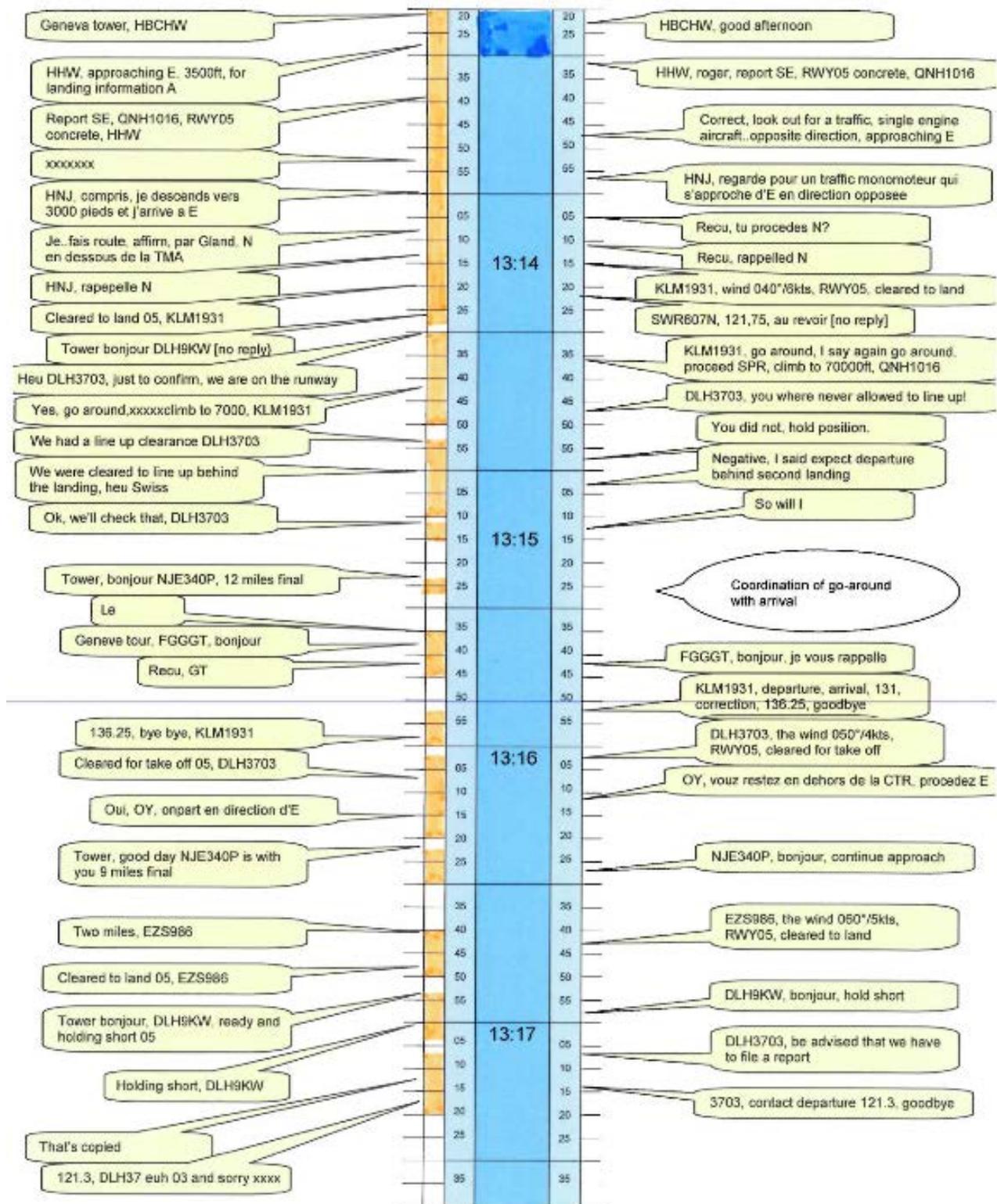
Recommendations:

Due to the scope of this account as a thesis project and not a formal investigation, I will refrain from stating any recommendations that could install confusion about their status out of context.

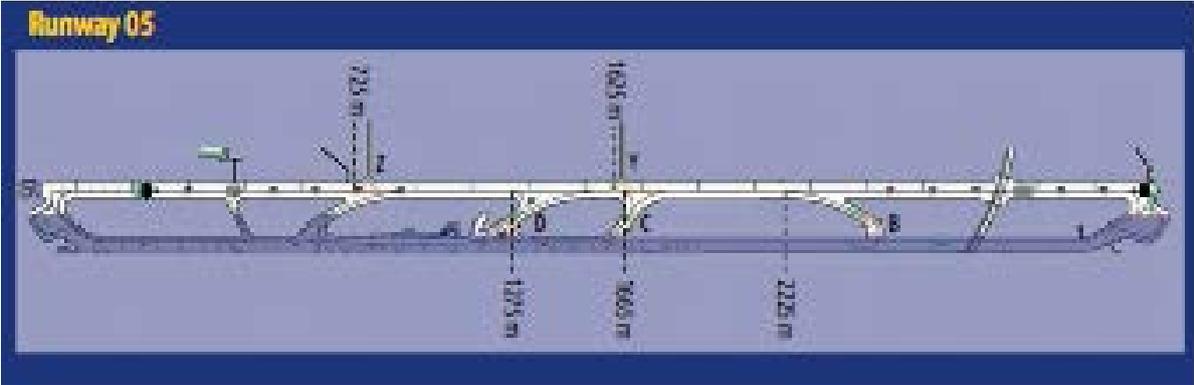
ANNEX 1:

Timeline: (orange color = frequency occupation)





Annex 3: Runway and Taxiway illustration



Annex 4: AIG Traffic statistics

		Statistiques du trafic					
		Résultats du trafic global / Global traffic					
	2003 %/total	2003	2002	variation %			
Passagers					Passengers		
Trafic local:					<i>Local traffic:</i>		
Trafic de ligne	90.7	7'340'156	6'901'421	6.4	<i>Scheduled traffic</i>		
Trafic hors des lignes (charter)	7.7	625'802	608'429	2.9	<i>Non scheduled traffic</i>		
Total trafic local	98.5	7'965'958	7'509'850	6.1	Total local traffic		
Trafic en transit direct	0.5	38'240	39'685	-3.6	<i>Direct transfer traffic</i>		
Total trafic de ligne et charter	99.0	8'004'198	7'549'515	6.0	Total scheduled and charter traffic		
Vols taxi, vols de plaisance et autres	0.6	44'500	33'918	31.2	<i>Taxi flights, leisure flights and other flights</i>		
Total trafic commercial	99.5	8'048'698	7'583'433	6.1	Total commercial traffic		
Trafic non commercial	0.5	39'792	36'294	9.6	<i>Non commercial traffic</i>		
Total trafic général	100.0	8'088'490	7'619'727	6.2	Total general traffic		
Mouvements					Movements		
Trafic de ligne	66.2	108'394	108'869	-0.4	<i>Scheduled traffic</i>		
Trafic hors des lignes (charter)	4.2	6'890	6'520	5.7	<i>Non scheduled traffic</i>		
Total trafic de ligne et charter	70.4	115'284	115'389	-0.1	Total scheduled and charter traffic		
Vols taxi, vols de plaisance et autres	11.0	18'028	16'350	10.3	<i>Taxi flights, leisure flights and other flights</i>		
Total trafic commercial	81.4	133'312	131'739	1.2	Total commercial traffic		
Trafic non commercial	18.6	30'448	32'069	-5.1	<i>Non commercial traffic</i>		
Total trafic général	100.0	163'760	163'808	0.0	Total general traffic		
Marchandises (tonnes)					Goods (tons)		
Trafic de ligne	46.2	25'970	24'964	4.0	<i>Scheduled traffic</i>		
Trafic hors des lignes (charter)	11.0	6'190	5'901	4.9	<i>Non scheduled traffic</i>		
Fret aérien avionné	57.2	32'160	30'865	4.2	Crafted air freight		
Fret aérien camionné	30.0	16'867	16'739	0.8	<i>Trucked air freight</i>		
Total fret aérien	87.3	49'027	47'604	3.0	Total air freight		
Poste locale	12.7	7'163	7'258	-1.3	<i>Local mail</i>		
Total fret aérien et poste	100.0	56'190	54'862	2.4	Total air freight and mail		

Annex C: Interview Questionnaire

Interview Protocol:

Date:	
Interviewee:	
Function:	
Place:	
Duration:	
Additional info:	

Introduction:

- Thank you for spending your time and effort and for receiving me
- Brief introduction of the research and the issue
- Structure and time foreseen for interview revisited
- Emphasize the confidentiality and the exploratory nature of research
- Any questions from the interviewee prior to research interview?

Part 1: applied processes and regulations:

a) What are the applied processes that introduce AAIB reports into judicial evaluations?

(Who does what after the publication of an AAIB report?)

Notes:

b) What paragraphs in the criminal law apply in such cases?

Notes:

c) An AAIB report is originally created with a different objective (safety) and for a different audience. How does the judicial system code or transform these accounts into information that is relevant from a legal perspective?

Notes:

d) What are the problems, if any, in doing so?

Notes:

e) What does the judicial system look for in an AAIB report like this, when determining culpability?

Notes:

f) How or where do you/the judicial system draw the line for acceptable behavior?

Notes:

g) What is the role of the outcome of the incident?

Notes:

h) Where in this report do you/the judicial system find indications of individual failures?

Notes:

i) How is human error transposed into a legal term like negligence?

Notes:

j) How is domain expertise included in judicial assessments of AAIB reports?

Notes:

k) Does the judicial system assume that an objective account can be achieved?

Notes:

l) The report attributes partial responsibility for the incident to the DLH pilot. What in your opinion lead the prosecution to only open proceedings against the ATCO?

Notes:

Part 2: Language and Terms:

m) What is the role or position of a term like human error in the judicial system?

Notes:

n) Do terms like system thinking or organizational breakdown have any relevance in the judicial domain? Why/why not?

Notes:

o) What does a term like “just culture” mean to the judicial system?

Notes:

p) What associations do terms like failed to or should have create in your mind? Again, in the context of assessing culpability.

Notes:

Part 3: The AAIB report and the alternative account:

q) I have extracted a number of statements from the AAIB report that can be described as normative or judgmental with regards to the ATCO's actions. Could these statements in your opinion contribute to the finding that the ATCO should be held legally accountable?

Notes:

I have created an alternative account for the ATM part, which has its emphasis on explaining performance in terms of goal conflicts and task saturation.

r) What associations would you connect with such terms?

Notes:

s) How do you think it could influence judicial assessments of individual culpability when an AAIB report contains an account with terms like task saturation and organizational trade off's?

Notes:

t) Would it change the perception of the individual actions and the possible culpability? Why/why not?

Notes:

German Translation of Questions

- a) Welche Prozesse werden angewendet um BFU Reports juristisch zu bewerten? (wer tut was nach der Veröffentlichung eines BFU Reports?)
- b) Welche Paragraphen im Strafgesetz sind in solchen Fällen anwendbar?
- c) Ursprünglich wurde ein solcher BFU Report mit einem anderen Ziel (safety) und für ein anderes Publikum geschrieben. Wie kodiert oder transformiert das Rechtswesen diese Darstellungen in Informationen welche aus juristischer Perspektive relevant sind?
- d) Welche Probleme, falls vorhanden, entstehen dabei?
- e) Worauf achtet das Rechtswesen in einem BFU Bericht wie diesem um Strafbarkeit festzustellen?
- f) Wie oder wo bestimmt das Rechtswesen die Grenze für akzeptables Benehmen?
- g) Welche Rolle spielt der Ausgang des Vorfalls?
- h) Wo finden Sie/das Gerichtswesen in diesem Bericht Anzeichen für individuelles Versagen?
- i) Wie werden menschliche Fehler in juristische Termen wie Fahrlässigkeit transponiert?
- j) In welcher Weise wird domänenspezifisches Expertenwissen in die Bewertung solcher BFU Berichte miteinbezogen?
- k) Geht das Gerichtswesen davon aus dass eine objective Beschreibung erreichbar ist?
- l) Der Bericht ordnet einen Teil der Verantwortung für den Vorfall den DLH Piloten zu. Was führte Ihrer Meinung nach die Staatsanwaltschaft dazu ausschliesslich gegen den FVL ein Gerichtsverfahren zu eröffnen?
- m) Welche Rolle oder Position hat ein Begriff wie Menschlicher Fehler im Gerichtswesen?
- n) Haben Begriffe wie systemisches denken oder Zusammenbruch der Organisation eine Relevanz im Gerichtswesen? Weshalb?/Weshalb nicht?
- o) Welche Bedeutung hat ein Begriff wie "Just Culture" im Gerichtswesen?
- p) Welche Assoziationen in bezug auf Strafbarkeit erzeugen bei Ihnen Begriffe wie "failed to" oder "should have"? (Passende Deutsche Begriffe: Versagen, vernachlässigen, unterlassen).
- q) Ich habe eine Reihe Aussagen aus dem BFU Bericht ausgewählt welche bezüglich der handlungen des FVL als normativ und bewertend bezeichnet werden können. Könnten diese Aussagen Ihrer Ansicht nach dazu beigetragen haben das der FVL Strafrechtlich belangt wurde?
- r) Welche Assoziationen verbinden Sie mit solchen Begriffen? (Zielkonflikte, Aufgaben Sättigung=Überlastungssituation)
- s) Wie denken Sie könnte es die Beurteilung von individueller Strafbarkeit beeinflussen wenn solche Begriffe in BFU Berichten enthalten wären?

t) Könnte es die Auffassung bezüglich individuellem handeln und dessen mögliche Strafbarkeit verändern?

Annex D: HF Terms and Investigation artifacts of hindsight

Hindsight Bias:

The hindsight bias (Fischhoff 1975) is one of the most consistent biases in psychology. One effect is that “people who know the outcome of a complex prior history of tangled, indeterminate events, remember that history as being much more determinant, leading “inevitably” to the outcome they already knew (Weick, 1995, p. 28) Hindsight allows us to change past indeterminacy and complexity into order, structure, and oversimplified causality (Reason, 1990). (Dekker, 2005, p. 68)

Hindsight biases your investigation towards items that you now know were important. As a result you may assess people’s decisions and actions mainly in the light of their failure to pick up this critical piece of data. It artificially narrows your examination of the evidence and potentially misses alternative or wider explanations of people’s behavior. (Dekker, 2006, p.23)

Local Rationality Principle:

The local rationality principle- “people’s behavior is rational when viewed from the inside of their situations” (Dekker 2005, p. 61) - reminds us that people do not come to work to do a bad job but that their actions must have made sense to them at the time when they occurred, otherwise they would not have performed these actions. “People are doing reasonable things given their point of view and focus of attention; their knowledge of the situation; their objectives and the objectives of the larger organization they work for.” (Dekker, 2006, p. 13).

The Bad Apple Theory:

There are basically two ways of looking at human error. The first view is known as the Old View or the Bad Apple Theory. It maintains that:

- Complex systems would be fine, were it not for the erratic behavior of some unreliable people (Bad Apples) in it;
- Human errors cause accidents; humans are the dominant contributor to more than two thirds of them;
- Failures come as unpleasant surprises. They are unexpected and do not belong in the system. Failures are introduced to the system only through the inherent unreliability of people. (Dekker 2006. P. 1)

The consequential countermeasures are typically to either remove, punish, reprimand or retrain the bad apples and further constrain performance through prescriptive procedures.

Counterfactual reasoning:

Tracing the sequence of events back from the outcome-that we as outside observers already know about- we invariably come across joints where people had opportunities to revise their assessment of the situation but failed to do so, where people were given the option to recover from their route to trouble, but did not take it. These are counterfactuals-quite common in accident analysis...Counterfactuals prove what could have happened if certain minute and often utopian conditions had been met (Dekker, 2005, p. 70).

Micro matching:

One of the most popular ways you can assess performance after the fact is to hold it up against a world you now know to be true. There are various after the fact worlds that you can bring to life:

- A procedure or collection of rules: People's behavior was not in accordance with standard operating procedures that were found to be applicable for the situation afterwards.
- A set of cues: People missed cues or data that turned out to be critical for understanding the true nature of the situation.
- Standards of good practice: People's behavior fall short of standards of good practice in the particular industry.

The problem is that these after-the-fact-worlds may have very little in common with the actual world that produced the behavior under investigation. They contrast people's behavior against the investigator's reality, not the reality that surrounded the behavior in question. Thus, micro-matching fragments of behavior with these various standards explains nothing-it only judges. (Dekker, 2006, p. 29-30)

Cherry Picking:

The second way in which you can take your data out of context, in which you give them meaning from the outside, is by grouping and labeling behavior fragments that, in hindsight, appear to represent a common condition. It is easy to pick through evidence of an accident sequence and look for fragments that all seem to point to a common condition. The investigator treats the voice record as if it were a public quarry to select stones from, and the accident explanation the building he needs to construct from those stones.... The condition that binds similar performance fragments together has little to do with the circumstances that brought each of the fragments forth, it is not a feature of the circumstances, it is an artifact of you as outside observer. (Dekker, 2006, p.33-34).

The shopping Bag:

With the benefit of hindsight, it is so easy to sweep together all the evidence that people should have seen. If they had, they would have recognized the situation for what we now know it turned out to be... Hindsight has a way of easily organizing all the evidence pointing to the (bad) outcome. But that doesn't mean the evidence presented itself that way to people at the time... By sweeping cues and indications about an unfolding situation together and presenting them as one big glob of overwhelming evidence, you import your own reality into the situation that surrounded other people at another time. That way you will never understand why it could have made sense for them to do what they did. You will simply be left wondering how they could have missed what seems to add up to such an obvious picture to you now. (Dekker, 2006, p.35-36)

Just Culture:

An atmosphere of trust in which people are encourage, even rewarded, for providing essential safety-related information-but in which they are also clear about where the line must be drawn between acceptable and unacceptable behavior. (Reason, 1997, p.195)

According to Dekker (2007) a just culture is about satisfying demands for accountability and contributing to learning and improvement at the same time (p. 90). Regarding the line for acceptable behavior he states "...we don't realize that lines don't exist out there ready to be

crossed or obeyed, but that we-people- construct those lines, that we draw the differently every time, and what matters is not where the line goes- but who gets to draw it. (p. X)

Annex E: Glossary

AAIB	Aircraft Accident Investigation Board
AIRPROX	Air Proximity
ANSP	Air Navigation Service Provider
ATC	Air Traffic Control
ATCO	Air Traffic Controller
CTR	Control Zone
FL	Flight Level
FOCA	Federal Office of Civil Aviation
Ft	Feet (100 feet = 33m)
ICAO	International Civil Aviation Organization
IFR	Instrument Flight Rules
ILS	Instrument Landing System
Kt	Knots (1 kt = 1.85 km/h)
NM	Nautical Miles (1NM = 1.85km)
OIR	Operational Internal Report
RWY	Runway
TMA	Terminal Maneuvering Area
TWR	Tower
VFR	Visual Flight Rules

