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ANSA and AIRADIO

COMMENTARY

on the Aircraft Accident of 1 / 2 July 2002

(Mid-air Collision of Flights DHX611 (DHL) + BTC2937 (BAL)

at Überlingen (Lake Constance) Germany

24 January 2004

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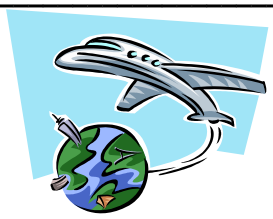

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PREFACE

to the
COMMENTARIES

on the Aircraft Accident of 1 July 2002
(Mid-air Collision between Flights DHX611 (DHL) + BTC2937 (BAL)
near Überlingen (Lake Constance) Germany

The independent, non-profit organizations ANSA (Switzerland) and AIRADIO (Germany) have prepared the following commentary on the collision of flights DHX611 and BTC2937 on 1 July 2002 near Überlingen (Lake Constance) since incomplete or partly wrong statements relating to this accident have been made by various parties, which must be obstructive to the findings of the actually responsible party.

Therefore, this commentary is based on the internationally and nationally relevant rules, standards, recommendations and procedures of the International Civil Aviation Organization (ICAO) and the Swiss air traffic services provider SKYGUIDE, as were current at the time of the accident.

The used references are the then current provisions of Switzerland and Germany as ratified by both states and incorporated into the national aviation (air transportation) legislation and respective regulations and enactments. These are

1. the standards of Annex 2, 10 and 11 to the ICAO Convention,
2. the procedures of ICAO documents 4444, 7030 and 8168, and
3. the corresponding Swiss provisions on the operations procedures for the provision of air traffic services as contained in the air traffic management manual (ATMM) of SKYGUIDE.

This commentary has been prepared by air traffic controllers, pilots and an aviation accident investigator of Germany, Switzerland and Turkey with long experience in air traffic control and the pilotage of aircraft under direction of Frank W Fischer. It serves the purpose of a complete clarification of all then applicable provisions and procedures, as well as for the determination of the responsibilities of air traffic control on this accident.

Additional, local directives and procedures, which are not contained in the Swiss operations manual ATMM or in the aeronautical information publication (AIP) of Switzerland, could not and have not been considered. Also the statement of the air traffic controller on this accident was not available to the commentators.

Frank W Fischer
Air Traffic Control Expert
President ANSA and AIRADIO

COMMENTARIES
on the Aircraft Accident of 1 July 2002
(Collision of the Flights DHX611 (DHL) + BTC2937 (BAL)
near Überlingen (Lake Constance) Germany

CONTENTS

A Relevant references from ICAO Annex 11 (Air Traffic Services), Edition 13 of 1 Nov 2001

B Relevant references from ICAO Document 4444 - PANS/RAC (Procedures Air Navigation Services - Rules of the Air and Air Traffic Services), Edition 14 of 1 Nov 2001

C Relevant references from ICAO Annex 2 (Rules of the Air), Edition 9, including amendment 36 of 1 Nov 2001

D relevant references from ICAO Annex 10 Volume II (Aeronautical Telecommunications - Air Navigation Communication Procedures), Edition 5 of 1 Nov 2001

E Relevant references from ICAO Document 8168, Volume I PANS-OPS (Procedures Air Navigation Services - Aircraft Operations) including amendment 10 of 5 Nov 1998

F Relevant references from ICAO Document 7030 - SUPPS (Regional Supplementary Procedures - Europe), Edition of 20 Feb 2002

G Relevant references from the Swiss Air Traffic Management Manual - ATMM (Operations Procedures for the Provision of Air Traffic Services), Edition 20 of 1 Jun 2002

H Radio Telephony Transcript of Frequencies 128,050 and 119,920 MHz of Zürich ACC of 1 Jul 2002, as published on the internet by "aviation-safety.net"

I ANSA Comment of 20 Jan 2004 on Attachment H to BFU Braunschweig and Berne

J ANSA Comment of 20 Jan 2004 on the EUROCONTROL Press Release of 2 Jul 2002

K IFATCA Report of Oct 2002 on the Überlingen Accident as published in THE CONTROLLER, Vol. 41, No. 3, Title "Zürich Disaster" (NOT ATTACHED)

L ANSA Questions of 17 Jun 2003 to BFU (AAIB) Braunschweig on the background of the Accident of 1 Jul 2002

M ANSA Comment on this subject of 10 Jul 2002

ANSA + AIRADIO
Frank W Fischer
24 Jan 2004

REFERENCES TO ICAO ANNEXES AND DOCUMENTS
on the
RESPONSIBILITY OF ATS PROVIDERS
for the
ESTABLISHMENT AND MAINTENANCE OF STANDARD SEPARATION BETWEEN CONTROLLED FLIGHTS

A ICAO Annex 11 (Air Traffic Services) References

No.	page	para.	Subject
1	v	-	Applicability

The Standards and Recommended Practices in this document, together with the Standards in Annex 2, govern the application of the "Procedures for Air Navigation Services - Air Traffic Management" and the "Regional Supplementary Procedures - Rules of the Air and Air Traffic Services", in which latter document will be found subsidiary procedures of regional application.

Annex 11 pertains to the establishment of airspace, units and services necessary to promote a safe, orderly and expeditious flow of air traffic. A clear distinction is made between air traffic control service (ATC), FIS and alerting service. Its purpose, together with Annex 2, is to ensure that flying on international air routes is carried out under uniform conditions designed to improve the safety and efficiency of air (flight) operation.

The Standards and Recommended Practices in Annex 11 apply in those parts of the airspace under the jurisdiction of a Contracting State wherein air traffic services are provided and
....

Kommentar

ICAO "Standards & Recommended Practices" stellen Richtlinien und Empfehlungen dar, die von den ICAO Mitgliedsstaaten ratifiziert und in die nationale Luftverkehrs-Gesetzgebung übernommen wurde. Für Anhang 11 (Flugverkehrsdienste) trifft dies in vollem Umfange auch auf die Schweiz und Deutschland zu.

Comment

The ICAO standards and recommended practices have been ratified by the ICAO member states and been incorporated into their national aviation laws. For Annex 11 (Air Traffic Services) this has been done without exception by Switzerland and Germany.

2	v	-	Action by Contracting States

Notification of differences
The attention of Contracting States is drawn to the obligation imposed by Article 38 of the

Convention by which Contracting States are required to notify the Organization of any differences between their national regulations and practices and the International Standards contained in this Annex and any amendments thereto. Contracting States are invited to extend such notification to any differences from the Recommended Practices contained in this Annex, and any amendments thereto, when the notification of such differences is important for the safety of air navigation. ...

Kommentar

Sowohl die Schweiz auch Deutschland haben zum Anhang 11 keinerlei relevante Abweichungen in ihren Luftfahrthandbüchern (AIP) veröffentlicht, bzw. der ICAO gemeldet.

Comment

Switzerland as well as Germany have not reported any significant deviations on Annex 11 to ICAO, respectively published in their aeronautical information publications.

3 vi 1.a Status of Annex Components

An Annex is made up of the following component parts, not all of which, however, are necessarily found in every Annex; they have the status indicated:

1.a Standards and Recommended Practices adopted by the Council under the provisions of the Convention.

Standard
Any specification for physical characteristics, configuration, material, performance, personnel or procedure, the uniform application of which is recognized as necessary for the safety or regularity of international air navigation and to which Contracting States will conform in accordance with the Convention; in the event of impossibility of compliance, notification to the Council is compulsory under Article 38.

Recommended Practice
Any specification ..... which is recognized as desirable in the interests of safety, ...

Kommentar

ICAO Richtlinien sind für die Mitgliedsstaaten bindend. Die Anwendung von Empfehlungen ist wünschenswert. Sollte die Einhaltung unmöglich sein, ist gemäß Artikel 38 der ICAO Konvention die Benachrichtigung der ICAO und eine entsprechende Bekanntmachung im nationalen Luftfahrthandbuch erforderlich.

Comment

ICAO standards are binding for its member states. The application of recommended practices is desirable. A report to iCAO in accordance with para 38 of the ICAO Convention and a corresponding publication in the national aeronautical information publication are required, should the adherence be impossible.

4 2-1 2.1 Establishment of Authority

2.1.1 Contracting States shall determine, in accor-

dance with the provisions of this Annex and for the territories over which they have jurisdiction, those portions of the airspace and those aerodromes where air traffic services will be provided. They shall thereafter arrange for such services to be established and provided in accordance with the provisions of this Annex, except that, **by mutual agreement, a State may delegate to another State the responsibility for establishing and providing air traffic services in flight information regions, control areas** or control zones **extending over the territories of the former.**

2.1.1. Note If one State delegates to another State the responsibility for the provision of air traffic services over its territory, it does so without derogation of its national sovereignty. Similarly, the providing State´s responsibility is limited to technical and operational considerations and does not extend beyond those pertaining to the safety and expedition of aircraft using the concerned airspace. Furthermore, **the providing State in providing air traffic services within the territory of the delegating State will do so in accordance with the requirements of the latter** which is expected to establish such facilities and services for the use of the providing State as are jointly agreed to be necessary. It is further expected that the delegating State would not withdraw or modify such facilities and services without prior consultation with the providing State. Both the delegating and providing States may terminate the agreement between them at any time.

Kommentar 2.1.1

Dies ist geschehen und Deutschland hat an die Schweiz einen Teil des Luftraums im Süden, an den deutschen Kontrollbezirk Frankfurt und den oberen Kontrollbezirk Rhein angrenzend (Bereich Bodensee), zur Leistung der Flugverkehrsdienste durch die schweizer SKYGUIDE abgetreten.

2.1.1 Note
SKYGUIDE erfüllt diese ICAO Regel. Da die Regeln über die Leistung von Flugverkehrsdiensten in Deutschland nicht von denen in der Schweiz abweichen, gibt es für SKYGUIDE keine besonderen, abweichenden Verfahren einzuhalten.

Comment 2.1.1

This has happened and Germany has delegated to Switzerland part of its airspace in the south, which is adjacent to the German control area Frankfurt and the upper control area Rhein (Lake Constance) for provision of air traffic services by SKYGUIDE of Switzerland.

2.2.1 Note
SKYGUIDE fulfils this ICAO regulation. Since the regulations on the provision of air traffic services in Germany do not differ from those in Switzerland, there is no need for SKYGUIDE to adhere to any special deviating procedures.

5 2-1 2.1.3 When it has been determined that air traffic services will be provided, the States concerned shall designate the authority responsible for providing such services.

2.1.3 Note 1 The authority responsible for establishing

and providing the services may be a State **or a suitable Agency.**

2.1.3 Note 2 Situations which arise in respect of the establishment and provision of air traffic services to either part or whole of an international flight are as follows:

Sit.2 A route, or portion of a route, contained within airspace under the sovereignty of a State which has, by mutual agreement, delegated to another State, responsibility for the establishment and provision of air traffic services.

For the purpose of this Annex, the State which designates the authority responsible for establishing and providing the air traffic services is in Situation 2: the State to whom responsibility for the establishment and provision of air traffic services has been delegated.

Kommentar 2.1.3 Note

In der Schweiz ist die Zuständigkeit zur Leistung der Flugverkehrsdienste an SKYGUIDE delegiert. Im Fall "Überlingen" trifft ICAO "Situation 2" zu. Für diesen Fall liegt die Verantwortung für die Delegierung der Zuständigkeit zur Leistung der Flugverkehrsdienste durch SKYGUIDE beim Schweizer Bund.

Comment 2.1.3 Note

In Switzerland the authority on the provision of the air traffic services has been delegated to SKYGUIDE. In the "Überlingen" case ICAO "situation 2" applies. In this case the responsibility on the delegation of the authority for the provision of the air traffic services rests with the Swiss Federation.

6 2-1 2.2 Objectives of the Air Traffic Services

2.2.a+d The objectives of the air traffic services shall be to:
a) **prevent collisions between aircraft**
b) ...
c) ...
d) **provide advice and information useful for the safe and efficient conduct of flights;**
e) ...

Kommentar 2.2.a+d

Vorrangige Aufgabe der Flugverkehrsdienste ist es, Kollisionen zwischen Luftfahrzeugen zu vermeiden, sowie Ratschläge und Informationen zur sicheren Flugdurchführung zu erteilen.

Comment 2.2.1.a + d

It is the primary duty of the air traffic services to avoid the collision between aircraft, as well as to provide advice and information for the safe conduct of flights.

7 2-2 2.3 Divisions of Air Traffic Services

The air traffic services shall comprise three services identified as follows:

2.3.1 The air traffic control service, to accomplish objectives a, b and c of 2.2, this service being divided in three parts as follows:

a) Area Control Service
the provision of air traffic control service for controlled flights, except for those parts of such flights described in 2.3.1.b and c, in order to accomplish objectives a and c of 2.2;

b) Approach Control Service
...

c) Aerodrome Control Service
...

2.3.2 The flight information service, to accomplish objective d of 2.2

Kommentar 2.3.1.a + 2.3.2

Diese grundsätzliche ICAO Regelung besteht bis heute unverändert und stellt eine der Grundvoraussetzungen für den Flugverkehrskontrolldienst dar, Staffelung zwischen kontrollierten Flügen zu erstellen und aufrecht zu erhalten, ohne Rücksicht darauf, ob ein Luftfahrzeug mit ACAS ausgerüstet ist oder nicht. ACAS (TCAS) dient somit den Piloten lediglich als letzte Warnung und Empfehlung zur Kollisions-Vermeidung, nachdem der Flugverkehrskontrolldienst seiner Verpflichtung zur Staffelung nicht nachgekommen ist oder es sich bei den gefährdenden Luftfahrzeugen um einen unkontrollierten und daher dem Flugverkehrskontrolldienst unbekannten Flug handelt.

Comment 2.3.1.a + 2.3.2

This basic ICAO regulation until today remains to be valid and constitutes a basic precondition for the air traffic control service to establish and maintain separation between controlled flights without reference to the equipage of aircraft with ACAS. That means ACAS (TCAS) serves the pilots only as a last warning and advice on the possible avoidance of a collision following the air traffic control service´s neglect on its responsibility for separation or a situation wherein the endangering flight constitutes an uncontrolled flight not known to the air traffic control service.

8 2-2 2.4.2 **The carriage of airborne collision avoidance systems (ACAS) by aircraft in a given area shall not be a factor in determining the need for air traffic services in that area.**

Kommentar 2.4.2

Im Fall "Überlingen" war der Bezirkskontrolldienst (area control service) und der Fluginformationsdienst betroffen.

Comment 2.4.2

In the "Überlingen" case the area control service and the flight information service have been concerned.

9 2-3 2.6 Classification of Airspaces

2.6.1 Class C ATS airspaces shall be classified and designated in accordance with the following:

Class C
IFR and VFR flights are permitted, all flights are provided with air traffic control service and IFR flights are separated from other IFR flights and from VFR flights. VFR flights are separated from IFR flights and receive traffic information in respect of other VFR flights.

Kommentar 2.6.1

Im Fall "Überlingen" bewegten sich beide Flugzeuge im Luftraum der Kategorie C.

Comment 2.6.1

In the "Überlingen" case both aircraft operated in class C type airspace.

10	2-3	2.8	Establishment and Designation of the Units providing Air Traffic Services
		2.8.2	Air traffic control units shall be established to **provide air traffic control service, flight information service** and alerting service **within control areas,** control zones and at controlled aerodromes.

Kommentar 2.8.2

Die Richtlinie unter § 2.8.2 war erfüllt.

Comment 2.8.2

The standard under para 2.8.2 had been fulfilled.

11	2-11	2.26	ATS Safety Management
		2.26.1	**States shall implement systematic and appropriate ATS safety management programmes to ensure that safety is maintained in the provision of ATS within airspaces** and at aerodromes

Kommentar 2.26.1

Es kann nicht beurteilt werden, ob der Staat dieser Verpflichtung nachgekommen ist.

Comment 2.26.1

It cannot be judged wether the State has fulfilled this obligation.

12	3-1	3.1.	Application
		3.1.a	Air traffic control service shall be provided a) to all IFR flights in airspace Classes A, B, C, D and E; b) to all VFR flights in airspace Classes B, C and D c) ... d) ...

Kommentar 3.1.a

Die Richtlinie unter § 3.1.a war erfüllt.

Comment 3.1.a

The standard under para 3.1.a had been fulfilled.

13	3-1	3.2	Provision of Air Traffic Control Service The parts of air traffic control service described in 2.3.1 shall be provided by the various units as follows:
		3.2.a.1	a) Area Control Service 1) by an area control centre 2) ...

b) ...
c) ...

Kommentar 3.2.a.1

Die Richtlinie unter § 2.a.1 war erfüllt.

Comment 3.2.a.1

The standard under para 2.a.1 had been fulfilled.

14	3-1	3.3	Operation of Air Traffic Control Service
		3.3.1a.+b+c	In order to provide air traffic control service, an ATC unit shall: a) be provided with information on the intended movement of each aircraft, or variations therefrom, and with current information on the actual progress of each aircraft; b) determine from the information received, the relative positions of known aircraft to each other; c) issue clearances and information for the purpose of preventing collision between aircraft under its control and of expediting and maintaining an orderly flow of traffic; d) ...

Kommentar 3.3.1.a

Der erste Teil der Richtlinie unter § 3.3.1.a scheint erfüllt worden zu sein (Flugverlaufs-Kontrollstreifen beider Flüge vorhanden). Ob der zweite Teil dieser Richtlinie (laufende Information über den tatsächlichen Verlauf beider Flüge), erfüllt war, ist insbesondere für den Flug BTC 2937 fraglich, da zwischen dem ersten Funkspruch bei Einflug in den Zuständigkeitsbereich Zürich und dem letzten Funkspruch mit BTC2937 keinerlei Funkverkehr mehr stattfand. Daraus muss geschlossen werden, daß der Verlauf dieses Fluges über diesen Zeitraum hinweg völlig unbeachtet blieb. Die Richtlinie unter § 3.3.1.b scheint (auf der Beurteilungs-Grundlage der Funkpsruch - Tonbandumschrift) ebenso wie die unter § 3.3.1.a (2. Teil) nie erfüllt worden zu sein. Die Richtlinie unter § 3.3.1.c wurde zu spät erfüllt, d.h. so spät, daß ein Zusammenstoß von den Piloten nicht mehr verhindert werden konnte.

Comment 3.3.1.a

It seems that the first part of the standard under para 3.3.1.a had been fulfilled (flight progress strips on both flights available). It is doubtful if the second part of this standard (current information on the actual progress of both flights) had been fulfilled, especially so for flight BTC 2937 since no exchange of radio telephony messages took place between the initial call upon entry into the area of jurisdiction of Zürich and the last radio message with BTC 2937. It must therefore be concluded that the progress of this flight over this period of time was completely unnoticed. The standard under para 3.3.1.b (on the basis of the available radiotelephony transcript) as well as the one under para 3.3.1.a (2. part) has apparently never been fulfilled. The standard under para 3.3.1.c was fulfilled too late. That means so late that a collision could no longer be avoided by the pilots.

15	3-1	3.3.2	Information on aircraft movements, together with a record of ATC clearances issued to such aircraft, shall be so displayed as to permit ready analysis in order to maintain an efficient flow of air traffic with adequate separation between aircraft.

Kommentar 3.3.2

Die Befolgung der Richtlinie 3.3.2 hätte bedeutet, daß die Flugverlaufs-Kontrollstreifen beider Flüge an einem einzigen Arbeitsplatz gemeinsam aufgelegt, entsprechend ausgefüllt und markiert waren. Sofern dies tatsächlich der Fall war, mußten die beiden Streifen ausgereicht haben (auch ohne verfügbare Radardatendarstellung), den Konflikt zu erkennen und rechtzeitig entsprechende Anweisungen an die beteiligten Flugzeuge zu geben.

Comment 3.3.2

The application of standard 3.3.2 would have meant that the flight progress strips of both flights had both been displayed at only one, joint working position, had been properly filled in and marked. If this was the case, then these control strips must have been sufficient (also without any available radar traffic situation presentation), to identify the conflict and to issue corresponding instructions to the participating aircraft in time.

```
16    3-1   3.3.3.b          Clearances issued by ATC units shall provide
                             separation

                             a) ...
                             b) between IFR flights in airspace Classes C,
                                D and E
                             c) ...

                             except that ...
```

Kommentar 3.3.3.b

Richtlinie 3.3.3.b wurde nicht erfüllt.

Comment 3.3.3.b

The standard under para 3.3.3.b had not been fulfilled.

```
17    3-2   3.3.4.a+b        Separation by an ATC unit shall be obtained
                             by at least one of the following:

                             a) vertical separation , obtained by assign-
                                ing different levels selected  from:
                                1) the tables of cruising levels in Appen-
                                   dix 3 of Annex 2 or
                                2) ...
                             except that ...

                             b) horizontal separation, obtained by provid-
                                ing:
                                1) longitudinal separation, by maintaining an
                                   interval between aircraft operating along
                                   the same, converging or reciprocal tracks,
                                   expressed in time or distance; or
                                2) ...
                             c) ...
```

Kommentar 3.3.4.a+b

Richtlinie 3.3.4.a+b erlaubte entweder rechtzeitig vertikale Staffelung zwischen den beiden beteiligten Flügen zu erstellen, was unterblieb, oder veränderte Längsstaffelung unter Anwendung von Geschwindigkeitskontrolle und Entfernungsmeßgeräte (DME) Staffelung, bzw. mittels Radar-Kursführung anzuweisen (radar vectoring).

Comment 3.3.4.a + b

Standard 3.3.4.a + b allowed to either establish vertical separation in time between the two participating aircraft (which was not done) or to establish modified longitudinal separation in applying speed control and distance based (DME) separation, respectively instruct course deviations by means of radar vectoring.

18	3-2	3.4	Separation Minima
		3.4.1.a	The selection of separation minima for application within a given portion of airspace shall be as follows: a) the separation minima shall be selected from those prescribed by the provisions of the PANS-ATM and the *Regional Supplementary Procedures (Doc 7030)* as applicable under the prevailing circumstances except that, where types of aids are used or circumstances prevail which are not covered by current ICAO provisions, other separation minima shall be established as necessary by: 1) the appropriate ATS authority, ...

Kommentar 3.4.1.a

Richtlinie 3.4.1.a schreibt vor, welche Staffelungs-Minima anwendbar gewesen wären, d.h. alle die im ICAO Dokument 4444 (PANS-ATM) enthaltenen und hierauf anwendbaren.

Comment 3.4.1.a

Standard 3.4.1.a prescribes which separation minima would have been applicable, i.e. all those contained in ICAO Document 4444 (PANS-ATM) applicable in this situation.

19	3-2	3.5	Responsibility for Control
		3.5.1	Responsibility for control of individual flights A controlled flight shall be under the control of only one ATC unit at any given time.

Kommentar 3.5.1

Richtlinie 3.5.1 war erfüllt.

Comment 3.5.1

Standard 3.5.1 had been fulfilled.

20	3-4	3.7.3	Read-back of clearances and safety-related information
		3.7.3.1	The flight crew shall read back to the air traffic controller safety-related parts of ATC clearances and instructions which are transmitted by voice. The following items shall be read back: a) ATC route clearances; b) clearances and instructions to enter, land on, take-off on, hold short of, cross and backtrack on any runway; and c) runway-in-use, altimeter settings, SSR codes, level instructions, heading and speed instructions and, whether issued by the controller or contained in ATIS broadcasts, transition levels.

Kommentar 3.7.3.1

Richtlinie 3.7.3.1 war erfüllt.

Comment 3.7.3.1

Standard 3.7.3.1 had been fulfilled.

21	3-4	3.7.3.1.2	The controller shall listen to the read-back to ascertain that the clearance or instruction has been correctly acknowledged by the flight crew and shall take immediate action to correct any discrepancies revealed by the read-back.

Kommentar 3.7.3.1.2

Richtlinie 3.7.3.1.2 war erfüllt.

Comment 3.7.3.1.2

Standard 3.7.3.1.2 had been fulfilled.

22	3-6	3.9	Provision of Radar Recommendation Radar systems should provide for the display of safety-related alerts and warnings, including **conflict alert**, conflict prediction, minimum safe altitude warning and unintentionally duplicated SSR codes.

Kommentar 3.9

Die Empfehlung 3.9 konnte nicht befolgt werden, da zur Zeit des Unfalls die STCA Funktion nicht verfügbar war.

Comment 3.9

The recommendation under 3.9 could not have been adhered to since the STCA function at the time of the accident was not available.

23	6-1	6.1	Aeronautical Mobile Service (A/G Communications)
		6.1.3	For area control service
		6.1.3.1	Air-ground communication facilities shall enable two-way communications to take place between a unit providing area control service and appropriately equipped aircraft flying anywhere within the control area(s).

Kommentar 6.1.3.1
Richtlinie 6.1.3.1 war erfüllt.

Comment 6.1.3.1

Standard 6.1.3.1 had been fulfilled.

24	App4-1	App. 4 - C	Appendix 4 ATS Airspace Classes Services provided and flight requirements A ... B ... **C** Type of flight **IFR** Separation provided IFR from IFR

```
                                IFR from VFR
      Service provided          ATC service
      Speed limitation          not applicable
      Radio-communication       continuous two-way
      Subject to ATC clearance yes

C     Type of flight            VFR
      Separation provided       VFR from IFR
      Service provided          1) ATC service
                                   for separation
                                   from IFR
                                2) VFR/VFR traffic
                                   information
                                   (and traffic
                                   avoidance advice
                                   on request)
      Speed limitation          250 kt IAS below
                                3050 m (10000 ft)
                                AMSL
      Radio communication       continuous two-way
      Subject to ATC clearance yes

D     ...
E     ...
F     ...
G     ...
```

Kommentar

Die unter Luftraumkategorie C für IFR (Instrumenten Flugregeln) Flüge zu leistenden Dienste wurden nicht erfüllt; d.h. Erstellung von Staffelung zwischen IFR und IFR Flügen.

Comment

The services to be provided under airspace class C for IFR (instrument flight rules) flights had not been provided, i.e. the establishment of separation between IFR and IFR flights.

Anmerkung

Obwohl der Begriff "ATS / Flugverkehrsdienste" die Schlußfolgerung nahe legt, daß Luftfahrzeugführer diese "Dienst-leistung" nach Bedarf in Anspruch nehmen, bzw. auf sie verzichten könnten, haben alle Mitgliedsstaaten der ICAO beschlossen, daß Flüge nach IFR (obligatorisch für gewerbsmäßige Flüge zur Beförderung von Personen und Fracht) ohne Ausnahme den FlugverkehrsKONTROLLdienst in Anspruch nehmen müssen, wo immer er geleistet wird, d.h. zwangsweise. Damit verbunden ist die obligatorische Befolgung der Regeln und Verfahren der Flugverkehrs-KONTROLLE (air traffic control) und die Abhängigkeit von den Freigaben und Anweisungen der Flugverkehrskontrolle.

Note

Whereas the term "ATS / Air Traffic Services" might lead to the conclusion that aircraft pilots may use this service provision when desired, respectively could waive them, all ICAO member states have concluded that flights in accordance with IFR (obligatory for commercial flights for the transport of persons and freight) will have to accept the air traffic control service without exception, wherever it is available, i.e. mandatorily. As a consequence the adherence to the regulations and procedures of the air traffic control service is obligatory, as is the adherence on the clearances and instructions of the air traffic control service.

ANSA + AIRADIO
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REFERENCES TO ICAO ANNEXES AND DOCUMENTS
on the
RESPONSIBILITY OF ATS PROVIDERS
for the
ESTABLISHMENT AND MAINTENANCE OF STANDARD SEPARATION BETWEEN CONTROLLED FLIGHTS

B ICAO Document 4444 (PANS/ATM) Chapter 4, 5 + 8 References

No.	page	para.	Subject
1	xi	2	Scope and Purpose
		2.1	**The *Procedures for Air Navigation Services - Air Traffic Management* (PANS-ATM) are complementary to the Standards and Recommended Practices contained in Annex 2 - *Rules of the Air* and in Annex 11 - *Air Traffic Services.*** They are supplemented when necessary by regional procedures contained in the *Regional Supplementary Procedures* (Doc 7030). Note 1 Although these procedures are mainly directed to ATC personnel, flight crews should be familiar with the procedures contained in the following chapters of the document. Note 2 ...
		2.2	**The *Procedures for Air Navigation Services - Air Traffic Management* (PANS-ATM) specify, in greater detail than in the Standards and Recommended Practices, the actual procedures to be applied by air traffic services units in providing the various air traffic services to air traffic.**

Kommentar 2.1 + 2.2

Die PANS-ATM haben weltweit Geltung. Sowohl die schweizerischen als auch die deutschen zuständigen Stellen haben keine auf den Fall "Überlingen" bezogenen Abweichungen erklärt. Da keine Abweichungen zu den PANS-ATM bestehen, waren alle im Dokument 4444 enthaltenen Verfahren im Fall "Überlingen" anwendbar, bzw. anzuwenden.

Comment 2.1 + 2.2

The PANS-ATM are being recognized worldwide. The Swiss as well as the German appropriate authorities have not declared any deviations to standards and procedures as applicable to the "Überlingen" case. Since no such deviations exist to the PANS-ATM, all respective procedures of document 4444 were applicable in the "Überlingen" case.

2	xi	3	Status
		3.1	The Procedures for Air Navigation Services (PANS) do not have the same status as the Standards and Recommended Practices. While the latter are adopted by Council in pursuance of Article 37 of the Convention on International

Civil Aviation, subject to the full procedure of Article 90, **the PANS are approved by the Council and recommended to Contracting States for worldwide application.**

Kommentar 3.1

Während die Anhänge 2 (Flugverkehrsregeln) und 11 (Flugverkehrsdienste) die Voraussetzungen und Bedingungen zur Leistung der Flugverkehrsdienste enthalten, gibt Dokument 4444 die sich darauf beziehenden Verfahren wieder.

Comment 3.1

Whereas annexes 2 (Rules of the Air) and 11 (Air Traffic Services) contain the prerequisites and conditions on the performance of the air traffic services, document 4444 contains the respective corresponding procedures.

3 1-3 Definitions

Air Traffic Control Clearance

Authorization for an aircraft to proceed under conditions specified by an ATC unit.

Note 1
For convenience, the term "air traffic control clearance" is frequently abbreviated to "clearance" when used in appropriate contexts.

Note 2
The abbreviated term "clearance" may be prefixed by the words "taxi", "take-off", "departure", "en-route", "approach" or "landing" to indicate the particular portion of flight to which the ATC clearance relates.

Air Traffic Control Instruction

Directives issued by air traffic control for the purpose of requiring a pilot to take a specific action.

Kommentar

Kontrollierte Flüge benötigen zum Flug und einzelnen Flugbewegungen (flight manoeuvres) jeweils eine Flugverkehrs-Kontrollfreigabe des Flugverkehrskontrolldienstes. Den Anweisungen des Flugverkehrskontrolldienstes durch den Flugverkehrsleiter (air traffic controller) muß außer in Situation zur Abwehrung von Gefahren Folge geleistet werden.

Comment

To begin a flight and for individual flight manoeuvres a controlled flight requires an air traffic control clearance of the air traffic control service. Instructions by an air traffic controller of the air traffic control service must be adhered to, except in emergency situations endangering the safety of the aircraft.

4 2-1 2.1

ATS Safety Management - General

2.1.1

States shall ensure that the level of air traffic services (ATS) and communications, navigation and surveillance, as well as the ATS procedures applicable to the airspace or aerodrome concerned, are appropriate and adequate for maintaining an acceptable level of safety in the provision of ATS.

Kommentar 2.1.1

Die Erfüllung dieser Aufgabe liegt in der Verantwortlichkeit der zuständigen staatlichen Behörde, in diesem Falle für die Schweiz und Deutschland ihren Verkehrsministerien und dem diesen nachgeordneten Bundesamt für Zivil-Luftfahrt (BAZL) in der Schweiz, bzw. dem Luftfahrtbundesamt (LBA) in Deutschland.

Comment 2.1.1

The fulfilment of this task is the responsibility of the appropriate governmental authority, in this case the transport ministries of Switzerland and Germany and their subordinate federal office for civil aviation (FOCA) in Switzerland and the Federal Aviation Administration (LBA) of Germany.

5 2-1 2.2 Objectives

The objectives of ATS safety management are to ensure that:

a) **the established level of safety applicable to the provision of ATS within an airspace** or at an aerodrome **is met;** and

b) safety-related enhancements are implemented whenever necessary.

Kommentar 2.2.a

Die Aufgabe unter 2.2.a wurde vom BAZL und von SKYGUIDE nicht im notwendigen Maße erfüllt.

Comment 2.2.a

The task under para 2.2.a has not been fully fulfilled by the FOCA and by SKYGUIDE to the extent necessary.

6 4-1 4.3 Division of Responsibility for Control between Air Traffic Control Units - General

4.3.1 The appropriate ATS authority shall designate the area of responsibility for each ATC unit and , when applicable, for individual control sectors within an ATC unit. Where there is more than one ATC working position within a unit or a sector, the duties and responsibilities of the individual working positions shall be defined.

Kommentar 4.3.1

Die Verantwortlichkeit für den Luftraum-Zuständigkeitsbereich bei der Flugverkehrs-Kontrollzentrale Zürich war geregelt, nicht aber anscheinend die Arbeitsplatz-Verantwortlichkeiten bei zusammengelegten Arbeitsplätzen, bzw. für den Betrieb auseinander liegender Arbeitsplätze durch nur eine einzige Person.

Comment 4.3.1

The responsibility for the area of jurisdiction of the airspace with the air traffic control center Zürich had been properly regulated, but apparently not so the responsibilities for working positions in case of merged working positions, respectively for the operation of physically separated working positions by only one person.

7 4-3+4 4.5 Air Traffic Control Clearances

4.5.1 Scope and Purpose

4.5.1.1 **Clearances are issued solely for** expediting and **separating air traffic and are based on known traffic conditions which affect safety in aircraft operation.** Such traffic conditions include not only aircraft in the air and on

the manoeuvring area over which control is being exercised, but also any vehicular traffic or other obstructions not permanently installed on the manoeuvring area in use.

4.5.1.2 **If an air traffic control clearance is not suitable to the pilot-in-command of an aircraft, the flight crew may request and, if practicable, obtain an amended clearance.**

4.5.1.3 The issuance of air traffic control clearances by ATC units constitutes authority for an aircraft to proceed only in so far as known air traffic is concerned. ATC clearances do not constitute authority to violate any applicable regulations for promoting the safety of flight operations or for any other purpose; **neither do clearances relieve a pilot-in-command of any responsibility whatsoever in connection with a possible violation of applicable rules and regulations.**

4.5.1.**4** **ATC units shall issue such ATC clearances as are necessary to prevent collisions and to expedite and maintain an orderly flow of air traffic.**

4.5.1.**5** **ATC clearances must be issued early enough to ensure that they are transmitted to the aircraft in sufficient time for it to comply with them.**

Kommentar 4.5.1.1 + 4.5.1.2 + 4.5.1.3 + 4.5.1.4 + 4.5.1.5

4.5.1.1
Die beiden betroffenen Flüge stellten bekannten Verkehr dar. Es wurde aber keine Flugverkehrs-Kontrollfreigabe zur Erstellung vorgeschriebener Staffelung zwischen den beiden Flügen erteilt, zumindest nicht bis zu dem Zeitpunkt als die zulässige Mindeststaffelung von 7 NM (für den Fall von Radarkontrolle) bereits um 3 NM unterschritten war.

4.5.1.2
Da beide Flugzeuge nichts voneinander wußten, war es auch nicht erforderlich, eine abweichende Freigabe von der zuvor erteilten zu beantragen.

4.5.1.3
Keines der beiden Flugzeuge brach eine Richtlinie der ICAO Flugverkehrskontrolldienst - Regeln oder ein diesbezügliches Verfahren.

4.5.1.4
Die Flugverkehrskontrolle Zürich hatte es unterlassen, rechtzeitig eine andere Flugverkehrs-Kontrollfreigabe an eines der beiden Flugzeuge zu erteilen, um die sich anbahnende Konfliktsituation zu vermeiden und das in einer Situation in der ein und derselbe Flugverkehrsleiter eines der beiden Flugzeuge (DHX611) selbst kurz zuvor in die Konfliktflugfläche 360 freigegeben hatte unter Außerachtlassung des Fluges BTC 2937.

4.5.1.5
Diese Regeln wurde völlig misachtet. Es ist auch nicht ersichtlich geworden, ob der Flugverkehrsleiter Verfahrenskontrolle (10 Minuten Staffelung) oder Radarkontrolle (7 NM Staffelung) anwenden wollte. Es hat den Anschein, daß Radarkontrolle angewendet werden sollte, denn er wies BTC2937 an, den Sekundär-Radar-Kode 7520 zu senden, teilte aber dem Piloten zu keiner Zeit mit, ob er ihn wie nach Dokument 4444 Regeln erforderlich, auch identifiziert hatte; eine Voraussetzung zur Anwendung von Radar-Kontrollverfahren.

Comment 4.5.1.1 + 4.5.1.2 + 4.5.1.3 + 4.5.1.4 + 4.5.1.5

4.5.1.1
Both flights concerned constituted known traffic. But no air traffic control clearance for the establishment of prescribed

separation between both flights had been issued, at least not until that point in time when the permissible minimum separation of 7 NM (in the case of radar control) had been reduced by 3 NM.

4.5.1.2
Since both flights did not know about each other, it was not necessary to ask for an amended clearance for the one previously received.

4.5.1.3
None of both aircraft violated an ICAO standard on air traffic control service regulations or a respective procedure.

4.5.1.4
The air traffic control center Zürich failed to issue another air traffic control clearance to one of the two flights in time in order to avoid the developing conflict, and that in a situation in which one and the same air traffic controller had himself cleared one of the two aircraft (DHX 611) to climb into the conflicting flight level 360 just shortly before in disregarding flight BTC 2937.

4.5.1.5
This rule had been completely disregarded. It is also not conclusive, whether the air traffic controller intended to apply procedural separation (10 minutes separation) or radar control (7 NM separation). It seems that the application of radar control was intended, since he instructed BTC 2937 to transmit secondary radar code 7520, but never informed the pilots, as required by document 4444 rules, whether he had identified the flight, which is a precondition for the application of radar control procedures.

8	4-13	4.13	Presentation and Updating of Flight Plan and Control Data
		4.13.1	General The appropriate authority shall establish provision and procedures for the presentation to controllers, and subsequent updating, of flight plan and control data for all flights being provided with a service by an ATS unit. Provision shall also be made for the presentation of any other information required or desirable for the provision of ATS.

Kommentar 4.13.1

Diese Regel der PANS-ATM schien erfüllt. Ob allerdings alle erforderlichen Einträge auf den Flugverlaufs-Kontrollstreifen der beiden Flüge gemacht wurden, ist unbekannt und wäre seitens der BFU festzustellen.

Comment 4.13.1

This rule of the PANS-ATM seemed to be fulfilled. However, whether all required entries on the flight progress strips of both flights had been made, is not known and would have to be determined by the accident investigation unit (BFU).

9	4-14	4.13.2	Information and data to be presented
		4.13.2.1	**Sufficient information and data shall be presented in such a manner as to enable the controller to have a complete representation of the current air traffic situation within the controller´s area of responsibility** and, when relevant, movements on the manoeuvring area of aerodromes. **The presentation shall be updated in accordance with the progress of aircraft, in order to facilitate the timely detection and resolution of conflicts as well as to facilitate and provide a record of coordination with adjacent ATS units and control sectors.**

Kommentar 4.13.2.1

Selbst bei völligem Verlust der Radar-Verkehrsdarstellung hatte der Flugverkehrsleiter anhand der ihm vorliegenden Flugverlaufs-Kontrollstreifen genügend Informationen und Daten zur Verfügung, um die gegebene Verkehrssituation zu erkennen. Es hat den Anschein, daß dieses Mittel der Verkehrsdarstellung nicht, wie erforderlich, auf dem laufenden gehalten wurde, um das rechtzeitige Erkennen der Konfliktsituation zu ermöglichen, bzw., sie wieder ins Gedächtnis zu rufen. Auch ist nicht bekannt, ob die Kontrollstreifen der beiden Flüge nur am Arbeitsplatz des oberen Luftraums aufgelegt waren, während sich der Flugverkehrsleiter am anderen, etwa 3 m entfernten Arbeitsplatz befand, so daß er diese Streifen gar nicht einsehen konnte, bzw. sie nicht beachtete.

Comment 4.13.2.1

Even with a complete failure of the radar-based traffic situation presentation the air traffic controller on the basis of the flight progress strips available to him had sufficient information and data available to himself in order to assess the given traffic situation. It seems that this means of presentation of the traffic situation was not kept updated as required in order to be able to detect the conflict situation in time, respectively to recall memory on it. It is also not known, whether the control strips of both flights had been displayed only at the working position of the upper airspace, while the air traffic controller sat at the other working position about 3 m away, so that he could not even check these strips, respectively failed to check them.

10	14-4	4.13.2.2	An appropriate representation of the airspace configuration, including significant points and information related to such points, shall be provided. Data to be presented shall include relevant information from flight plans and position reports as well as clearance and coordination data. The information display may be generated and updated automatically, or the data may be entered and updated by authorized personnel.

Kommentar 4.13.2.2

Siehe Kommentar zu Punkt 9.

Comment 4.13.2.2

See comment on item 9.

11	14-4	4.13.3	Presentation of Information and Data
		4.13.3.1	The required flight plan and control data may be presented through the use of paper flight progress strips or electronic flight progress strips, by other electronic presentation forms or by a combination of presentation methods.

Kommentar 4.13.3.1

Diese PANS-ATM Regeln war anscheinend erfüllt.

Comment 4.13.3.1

These PANS-ATM rules apparently had been fulfilled.

12	14-4	4.13.3.2	**The method(s) of presenting information and data shall be in accordance with Human Factors principles. All data, including data related to individual aircraft, shall be presented in a manner minimizing the potential for misinterpretation or misunderstanding.**

Kommentar 4.13.3.2

Diese PANS-ATM Regel scheint nicht erfüllt worden zu sein, insbesondere für den Fall, daß die Radar-Verkehrs-Darstellung für den oberen Luftraum nur auf dem 3 m entfernten Arbeitsplatz verfügbar war, wo sich der Flugverkehrs-leiter anscheinend über 4 Minuten Dauer gar nicht aufhielt.

Comment 4.13.3.2

This PANS-ATM rule does not seem to have been fufilled, especially in case the radar traffic situation display for the upper airspace was only available at the working position 3 m away, where the air traffic controller apparently did not stay for a period of over 4 minutes.

13	14-4	4.13.3.4	When flight progress strips (FPS) are used, there should be at least one individual FPS for each flight. The number of FPS for individual flights shall be sufficient to meet the requirements of the ATS unit concerned. Procedures for annotating data and provisions specifying the types of data to be entered on FPS, including the use of symbols, shall be specified by the appropriate authority.

Kommentar 4.13.3.4

Diese PANS-ATM Regel scheint erfüllt worden zu sein.

Comment 4.13.3.4

This PANS-ATM rule apparently had been fulfilled.

14	14-4	4.13.3.5	Data generated automatically shall be presented to the controller in a timely manner. The presentation of information and data for individual flights shall continue until such time as the data is no longer required for the purpose of providing control, including conflict detection and the coordination of flights, or until terminated by the controller.

Kommentar 4.13.3.5

Diese PANS-ATM Regel scheint erfüllt worden zu sein.

Comment 4.13.3.5

This PANS-ATM rule apparently had been fulfilled.

15	4-14	4.14	Failure or Irregularity of Systems and Equipment ATC units shall immediately report in accordance with local instructions any failure or irregularity of communication, navigation and surveillance systems or any other safety-significant systems or equipment which could adversely affect the safety or efficiency of flight operations and/or the provision of air traffic control service.

Kommentar 4.14

Der technische Zustand aller Systeme und Geräte zum Zeitraum des Unfalls war bekannt.

Comment 4.14

The technical status of all systems and equipment at the time of the accident was known.

16	5-1	5.2	Separation Methods and Minima General Provisions for the Separation of Controlled Traffic
		5.2.1.b	Vertical or horizontal separation shall be provided: a) ... b) between IFR flights in Class C, D and E airspaces; c) ...

Kommentar 5.2.1.b

Diese PANS-ATM Regel wurde nicht erfüllt.

Comment 5.2.1.b

This PANS-ATM rules was not fulfilled.

17	5-1	5.2.1.1	**No clearance shall be given to execute any manoeuvre that would reduce the spacing between two aircraft to less than the separation minimum applicable in the circumstances.**

Kommentar 5.2.1.1

Gemäß Sprechfunk-Transcript blieb diese Regel unbeachtet, da der Flug BTC2937 weder per Sekundärradar, wie vorgeschrieben, identifiziert wurde, noch ihm vom Flugverkehrsleiter eine Flugverkehrs-Kontrollfreigabe gegeben oder bestätigt wurde (z.B. ... maintain flight level 360). Nach der Anweisung, den SSR Transponder Kode 7520 zu senden, blieb der Flug anscheinend völlig unbeachtet.

Comment 5.2.1.1

According to the radio telephony transcript this rule was disregarded, since flight BTC2937 had neither been properly identified by secondary radar, as prescribed, nor received an air traffic control clearance or acknowledgement of his current clearance (e.g. ...maintain flight level 360) by the air traffic controller. After the instruction to transmit SSR transponder code 7520, the flight apparently remained completely neglected.

18	5-1	**5.2.1.3**	**Where the type of separation or minimum used to separate two aircraft cannot be maintained, another type of separation or another minimum shall be established prior to the time when the current separation minimum would be infringed.**

Kommentar 5.2.1.3

Diese PANS-ATM Regel blieb unbeachtet und wurde nicht erfüllt.

Comment 5.2.1.3

This PANS-ATM rule was disregarded and not fulfilled.

19	5-3	5.4 Note 1	Horizontal Separation Note 1 Nothing in the provisions detailed in Sections

5.4.1 and 5.4.2 hereunder precludes a State from establishing:

a) other minima for use in circumstances not prescribed; or

b) additional conditions to those prescribed for the use of a given minimum;

provided that the level of safety inherent in the provisions detailed in Sections 5.4.1 and 5.4.2 hereunder is at all times assured.

Kommentar 5.4

Regel 5.4 wurde von SKYGUIDE erfüllt, indem für den technischen Funktions-Status des Radardaten-Verarbeitungs- und -darstellungssystems zur Zeit des Unfalls anstatt 5 NM Radar-Mindeststaffelung, 7 NM vorgeschrieben wurden.

Comment 5.4

Rule 5.4 was fufilled by SKYGUIDE by prescribing a 7 NM minimum radar separation instead of 5 NM due to the functional status of the radar data processing and presentation system at the time of the accident.

20	5-6	5.4.2	Longitudinal Separation
		5.4.2.1	Longitudinal Separation Application
		5.4.2.1.1	Longitudinal separation shall be applied so that the spacing between the estimated positions of the aircraft being separated is never less than a prescribed minimum. Longitudinal separation between aircraft following the same or diverging tracks may be maintained by application of speed control, including the Mach number technique. …
		5.4.2.1.2	In applying a time- or distance-based longitudinal separation minimum between aircraft following the same track, care shall be exercised to ensure that the separation minimum will not be infringed whenever the following aircraft is maintaining a higher speed than the preceding aircraft. When aircraft are expected to reach minimum separation, speed control shall be applied to ensure that the required separation minimum is maintained.

Kommentar 5.4.2.1.1

Für den Fall, daß der Flugverkehrsleiter verfahrensmäßige (non-radar) Staffelung anwenden wollte, hat er diese Regel nicht erfüllt.

Comment 5.4.2.1.1

In case the air traffic controller had intended to apply procedural (non-radar) separation, this rule had not been fufilled.

21	5-8	5.4.2.2	Longitudinal Separation Minima based on Time
		5.4.2.2.1	**Aircraft maintaining the same level**
		5.4.2.2.1.2.b	**Aircraft flying on crossing tracks:** **a) ...**

b) 10 minutes (at the point of intersection of the tracks) if navigation aids permit frequent determination of position and speed.

Kommentar 5.4.2.2.1

Gesetzt den Fall, daß diese Regel angewendet werden sollte, wären 10 Minuten Staffelung zwischen den beiden Flügen anzuwenden gewesen.

Comment 5.4.2.2.1

In case it was intended to apply this rule, 10 minute longitudinal separation would have had to be applied between both flights.

22 5-29 5.10 Essential Traffic Information

5.10.1 General

5.10.1.1 **Essential traffic is that controlled traffic** to which the provision of separation by ATC is applicable, but **which , in relation to a particular controlled flight** is not, or **will not be, separated from other controlled traffic by the appropriate separation minimum.**

Kommentar 5.10.1.1

Zum Zeitpunkt der Staffelungs-Unterschreitung (sowohl 10 Minuten, als auch alternativ 7 NM im Falle von Radar-Staffelung) wurde keine Verkehrsinformation erteilt.

Comment 5.10.1.1

At the time of the infringement of the separation minimum (10 minutes, as well as, alternatively, 7 NM in case of radar control) no traffic information was issued.

23 5-30 5.10.1.2 **Essential traffic information shall be given to controlled flights concerned whenever they constitute essential traffic to each other.**

Kommentar 5.10.1.2

Siehe Kommentar zu Punkt 22.

Comment 5.10.1.2

See comment to item 22.

24 5-30 5.10.2 Information to be provided

Essential traffic information shall include:

a) direction of flight of aircraft concerned;
b) type and wake turbulence category (if relevant) of aircraft concerned;
c) cruising level of aircraft concerned and;
  1) estimated time over the reporting point nearest to where the level will be crossed; or,
  2) relative bearing of the aircraft concerned in terms of the 12-hour clock as well as distance from the conflicting traffic; or

3) **actual or estimated position of the aircraft concerned.**

Kommentar 5.10.2

Als zu dem wesentlich zu späten Zeitpunkt, als die Staffelung nur noch 4 NM betrug und vom Flugverkehrsleiter tatsächlich eine Verkehrsinformation gegeben wurde, war sie gemäß Regel 5.10.2 inkorrekt.

Comment 5.10.2

When the air traffic controller at that far too late point in time, when the remaining separation was only 4 NM, issued a traffic information, it (the traffic information) was not correct in accordance with rule 5.10.2.

Anmerkung
Die Erteilung einer Verkehrsinformation entbindet den Flugverkehrsleiter in keiner Weise von seiner Verpflichtung, wieder Mindest-Staffelung zu erstellen, mit welchen Mitteln auch immer. Die Tatsache, daß der Flugverkehrsleiter eine falsche Verkehrsinformation erteilte, läßt darauf schließen, daß er die Konfliktsituation sich völlig unbeachtet entwickeln liess und durch diese dann entstandene Situation bei seiner Rückkehr zum Arbeitsplatz des oberen Luftraums völlig überrascht war, als die beiden Flugzeuge nur noch 4 NM voneinander entfernt waren. Ansonst hätte er wohl keine falsche Richtungsangabe (2 o´clock) gemacht. Er scheint also gar nicht an diesem Arbeitsplatz gewesen zu sein, wozu er gemäß ICAO Anhang 10 verpflichtet gewesen wäre.

Note
The issuance of traffic information in no case relieves the air traffic controller of his responsibility to re-establish minimum separation, no matter by what means. The fact that the air traffic controller had issued a wrong traffic information lets one to conclude that he had the conflict situation develop completely unnoticed and that this situation caught him by complete surprise when he returned to the working position for the upper airspace, at the time when both aircraft were only 4 NM apart from each other. Otherwise, he certainly would not have given a wrong information on the direction (2 o´clock). He apparently was not present at this working position at all, which ICAO Annex 10 would have required.

25 8-1 8.1.4 Radar Services

Radar Systems Capabilities

Radar systems should provide for the display of safety-related alerts and warnings, including conflict alert, minimum safe altitude warning, conflict prediction and unintentionally duplicated SSR codes.

Kommentar 8.1.4

Diese technische PANS-ATM Forderung konnte das Radarsystem in der Nacht vom 1./2. Juli nicht erfüllen.

Comment 8.1.4

This technical PANS-ATM requirement could not be fulfilled by the radar system in the night of 1 / 2 July.

26 8-2 8.2 Presentation of Radar Information

8.2.1 Radar-derived information available for display to the controller shall, as a minimum, include radar position indications, radar map information and, when available, information from SSR Mode A, Mode C and Mode S.

8.2.2 The radar system shall provide for a continuously updated presentation of radar-derived information, including radar position indications.

Kommentar 8.2.1 + 8.2.2

Diese technische Forderung scheint erfüllt gewesen zu sein.

Comment 8.2.1 + 8.2.2

This technical requirement was apparently fulfilled.

27		8.2.7	Radar label information shall as a minimum include the SSR code transmitted by an aircraft or, when code/call sign conversion is effected, aircraft identification, and SSR Mode C - derived level information. All label information shall be presented in a clear and concise manner.

Kommentar 8.2.7

Diese technische Forderung scheint erfüllt gewesen zu sein.

Comment 8.2.7

This technical requirement was apparently fulfilled.

28	8-2	8.3	Communications
		8.3.1	Direct pilot-controller communications shall be established prior to the provision of radar services, unless special circumstances such as emergencies dictate otherwise.

Kommentar 8.3.1

Diese PANS-ATM Bedingung war nur zeitweise erfüllt, da der Flugverkehrsleiter Hörbereitschaft auf der Frequenz 128,050 nur zeitweise leistete, während er für kurze Zeit am Arbeitsplatz des oberen Luftraums weilte.

Comment 8.3.1

This PANS-ATM requirement was only fulfilled part of the time, since the air traffic controller maintained listening watch on frequency 128,050 only part of the time while he stayed at the working position for the upper airspace a short while.

29	8-2	8.4	Provision of Radar Services
		8.4.1	Where suitable radar-derived systems and communication systems are available, radar-derived information, including safety-related alerts and warnings such as conflict alert and minimum safe altitude warning, should be used to the extent possible in the provision of ATC service in order to improve capacity and efficiency as well as to enhance safety.

Kommentar 8.4.1

Diese Empfehlung konnte nicht befolgt werden, da die STCA Funktion dem Flugverkehrsleiter nicht zur Verfügung stand.

Comment 8.4.1

This recommendation could not be followed, since the STCA function was not available to the air traffic controller.

30	8-2	8.4.2.b+c+d+**e**	**The number of aircraft simultaneously provided with radar services shall not exceed that which can safely be handled under the pre-**

vailing circumstances, taking into account:

a) the structural complexity of the control area or sector concerned;
b) the radar functions to be performed within the control area or sector concerned;
c) assessments of controller workloads and sector capacity;
d) the degree of technical reliability and availability of the main radar and communi-cation systems;
e) the possibility of a radar equipment failure or other emergency that would eventually require reverting to back-up facilities and/or non-radar separation; and
f) the degree of technical reliability and availability of the back-up radar and communication systems.

Kommentar 8.4.2.e

Insbesondere Regel 8.4.2 wurde nicht erfüllt, da der Flugverkehrsleiter allem Anschein nach dem damals gegebenen Verkehr an zwei verschiedenen, auseinander liegenden, Arbeitsplätzen nicht gewachsen war. Abgesehen davon erfordert die Anwendung von Radarkontrolle, daß die betroffenen Flüge zuvor identifiziert worden sind und diese Identifizierung während der Anwendung von Radar-Staffelungs-Minima aufrechterhalten wird. Da der Flugverkehrsleiter sich aber zu dem anderen etwa 3 m entfernten Arbeitsplatz begab, war die Identifizierung (die für den Flug BTC2937 übrigens niemals den Vorschriften entsprechend erfolgte) unterbrochen und die Anwendung von Radar-Staffelungs-Minima unzulässig. Das heißt, der Flugverkehrsleiter hätte under den gegebenen Umständen zwischen den beiden Flügen entweder 1000 Fuß vertikale Staffelung oder 10 Minuten Horizontal-Staffelung erstellen müssen.

Comment 8.4.2.e

Especially rule 8.4.2 was not fulfilled, since the air traffic controller apparently was not able to handle the then prevailing traffic at two different, physically separated working positions. Apart herefrom the application of radar control requires that the flights concerned have been identified beforehand and that this identification be maintained during the application of radar separation minima. However, since the air traffic controller had moved to the other working position about 3 m away, the identification (which had never been performed properly in accordance with the given provision for flight BTC 2937) was interrupted and the application of radar separation minima therefore became inadmissible. This means that the air traffic controller would have had to establish either 1000 feet vertical separation or 10 minutes horizontal separation between the two flights under the given circumstances.

31 8-3 8.5.1 Use of SSR Transponders

To ensure the safe and efficient use of SSR, pilots and controllers shall strictly adhere to published operating procedures. Standard radiotelephony phraseology shall be used and the correct setting of transponder codes shall be ensured at all times.

Kommentar 8.5.1.

Die PANS-ATM Regel 8.5.1 wurde verletzt.

Comment 8.5.1

PANS-ATM rule 8.5.1 was violated.

32 8-5 8.6.1.2 Identification of Aircraft

The radar controller shall be satisfied that the available functional capabilities of the radar system as well as the information presen-

ted on the radar display(s) is adequate for the function to be performed.

Kommentar 8.6.1.2

Der Flugverkehrsleiter schien mit den verbliebenen betrieblichen Funktionen des Radarsystems zufrieden, was keiner Beanstandung bedarf.

Comment 8.6.1.2

Apparently, the air traffic controller seems to have been satisfied with the remaining operational functions of the radar system, which should not be criticized.

33 8-5 8.6.2 Identification of Aircraft

8.6.2.1 Establishment of Radar Identification

8.6.2.1.1 Before providing radar service to an aircraft, radar identification shall be established and the pilot informed. Thereafter, radar identification shall be maintained until termination of the radar service.

8.6.2.1.2 If radar identification is subsequently lost, the pilot shall be informed accordingly and, when applicable, appropriate instructions issued.

Kommentar 8.6.2.1.1

Die PANS-ATM Regel 8.6.2.1.1 wurde vom Flugverkehrsleiter nicht erfüllt. Siehe auch Kommentar zu Punkt 30. Regel 8.6.2.1.2 wurde vom Flugverkehrsleiter nicht erfüllt.

Comment 8.6.2.1.1

PANS-ATM rule 8.6.2.1.1 was not complied with by the air traffic controller. Also see the comment on item 30. Also rule 8.6.2.1.2 was not fulfilled by the air traffic controller.

34 8-5 8.6.2.2 SSR Identification Procedures

8.6.2.2.1.**e** **Where SSR is used, aircraft may be identified by one or more of the following procedures:**

a) recognition of the aircraft identification in a radar label;
b) recognition of an assigned discrete code, the setting of which has been verified, in a radar label;
c) direct recognition of the aircraft identification of a Mode-S-equipped aircraft in a radar label;
d) by transfer of radar identification;
e) observation of compliance with an instruction to set a specific code;
f) observation of compliance with an instruction to squawk IDENT.

Kommentar 8.6.2.2.1.b+e

Die Anwendung der PANS-ATM Regel 8.6.2.2.1.b+e wurde begonnen, aber nicht zu Ende geführt.

Comment 8.6.2.2.1.b + e

The application of PANS-ATM rule 8.6.2.2.1.b + e was begun, but not completed.

35 8-5 8.6.2.2.2 **When a discrete code has been assigned to an aircraft, a check shall be made at the earliest opportunity to ensure that the code set by the pilot is identical to that assigned for the flight. Only after this check has been made shall the discrete code be used as a basis for identification.**

Kommentar 8.6.2.2.2

Ob die PANS-ATM Regel 8.6.2.2.2 erfüllt wurde, bleibt ungewiss (SSR Kode 7520), denn 8.6.2.2.1 wurde nicht zu Ende geführt.

Comment 8.6.2.2.2

Whether PANS-ATM rule 8.6.2.2.2 was complied with remains uncertain (SSR code 7520), since 8.6.2.2.1 was not completed.

36 8-9 8.6.7 Interruption or Termination of Radar Service

8.6.7.1 An aircraft which has been informed that it is provided with radar service should be informed immediately when, for any reason, radar service is interrupted or terminated.

Kommentar 8.6.7.1

Gemäß Sprechfunk-Transcript wurde Flug DHX611 korrekt identifiziert, aber ebenfalls nicht darüber informiert, daß die Radarkontrolle (durch die Abwesenheit des Flugverkehrsleiters von diesem Arbeitsplatz) unterbrochen war. Insofern gelten die zuvor zum Flug BTC2937 gemachten Ausführungen ebenfalls für Flug DHX611.

Comment 8.6.7.1

According to the radio telephony transcript flight DHX 611 was correctly identified, but also not informed that radar control was interrupted by the air traffic controller due to his short absence from this working position. Insofar, the above conclusions on flight BTC 2937 also apply to flight DHX 611.

37 8-9 8.7.1 Use of Radar in the ATC Service

8.7.1.c+f Functions
The information presented on a radar display may be used to perform the following functions in the provision of ATC service:

a) provide radar services as necessary in order to improve airspace utilization, reduce delays, provide for direct routings and more optimum flight profiles, as well as to enhance safety;

b) provide radar vectoring to departing aircraft for the purpose of facilitating an expeditious and efficient departure flow and expediting climb to cruising level;

c) provide radar vectoring to aircraft for the purpose of resolving potential conflicts;

d) provide radar vectoring to arriving aircraft for the purpose of establishing an expeditious and efficient approach sequence;

e) provide vectoring to assist pilots in their

navigation, e.g. to or from a radio navigation aid, away from or around areas of adverse weather, etc.;

f) provide separation and maintain normal traffic flow when an aircraft experiences communication failure within the area of the radar coverage;

g) maintain radar monitoring of air traffic;

h) when applicable, maintain a watch on the progress of air traffic, in order to provide a non-radar controller with:

i) ..
ii) ..
iii) ...

Kommentar 8.7.1.c+f

Der Flugverkehrsleiter nahm nicht die Möglichgkeit wahr, einen der beiden Flüge mittels Radar-Kurs-Anweisungen aus der Konfliktsituation zu entfernen, was eine andere Möglichkeit gewesen wäre, den Zusammenstoss zu vermeiden, wenn er die beiden Flüge dauernd im Aufge behalten hätte.

Comment 8.7.1.c + f

The air traffic controller did not choose the given possibility to remove one of the two flights from the conflict situation by means of radar course instructions (vectoring), which was another possibility to avoid the collision, had he monitored both flights continuously.

38 8-10 8.7.2 Coordination of Traffic under Radar and Non-Radar Control

Appropriate arrangements shall be made in any ATC unit using radar to ensure the coordination of traffic under radar control with traffic under non-radar control, and to ensure the provision of adequate separation between the radar-controlled aircraft and all other controlled aircraft. To this end, close liaison shall be maintained at all times between radar controllers and non-radar controllers.

Kommentar 8.7.2

Diese Forderung scheint SKYGUIDE nicht erfüllt zu haben, es sei denn lokale Anweisungen enthalten dem entsprechende Regeln, welche Art Staffelung von zwei oder mehreren Arbeitsplätzen durch nur einen einzigen anwesenden Flugverkehrsleiter anzuwenden ist; abgesehen von dem damit verbundenen Verstoß des ICAO Anhangs 10 auf jeder in Betrieb befindlichen Funkfrequenz Hörbereitschaft aufrecht zu erhalten,was bei Zürich ACC anscheinend technisch gar nicht möglich war. Das heißt, Radarkontrolle konnte den ICAO Regeln entsprechend nur an dem Radar-Arbeitsplatz ausgeübt werden, an dem sich der Flugverkehrsleiter gerade befand.

Comment 8.7.2

Apparently, this requirement was not fulfilled by SKYGUIDE, except that possibly local instructions contain corresponding rules on which type of separation has to be applied for the operation of two or more working positions by only one air traffic controller present, apart from the associated violation of ICAO Annex 10 which requires to maintain a listening watch on each of the associated radio frequencies, which apparently was technically impossible at Zürich ACC.

39 8-10 8.7.3 Note Separation Application

Factors which the radar controller must take

into account in determining the spacing to be applied in particular circumstances in order to ensure that the separation minimum is not infringed include aircraft relative headings and speeds, radar technical limitations, controller workload and any difficulties caused by communication congestion. Guidance material on this subject is contained in the Air Traffic Services Planning Manual (Doc 9426).

Kommentar 8.7.3

Alle die in dieser Regel enthaltenen Aspekte wurden vom Flugverkehrsleiter in diesem Falle außer acht gelassen.

Comment 8.7.3

All aspects contained in this rule have been neglected by the air traffic controller.

40 8-10 8.7.3.1 **Except as provided for in 8.7.3.7 and 8.7.3.8 and 8.8.3.2, radar separation shall only be applied between identified aircraft when there is reasonable assurance that identification will be maintained.**

Kommentar 8.7.3.1

Eine Befolgung dieser Bedingung schloß für den Flugverkehrsleiter die Möglichkeit aus, Radarkontrolle für die Flüge DHX611 und BTC2937 anzuwenden.

Comment 8.7.3.1

Obeyance of this condition excluded the possibility for the air traffic controller to apply radar control on flights DHX 611 and BTC 2937.

41 8-10 8.7.3.7 In the event that the radar controller has been notified of a controlled flight entering or about to enter the airspace within which radar separation is applied, but has not radar identified the aircraft, the controller may, if so prescribed by the appropriate ATS authority, continue to provide radar service to identified aircraft provided that:

a) reasonable assurance exists that the unidentified controlled flight will be identified using SSR or the flight is being operated by an aircraft of a type which may be expected to give an adequate return on primary radar in the airspace within which radar separa-tion is applied; and

b) radar separation is maintained between the radar controlled flights and any other observed radar position until either the unidentified controlled flight has been identified or non-radar separation has been established.

Kommentar 8.7.3.7

Diese Regel erlaubte dem Flugverkehrsleiter weiterhin Radar-Staffelungs-Minima zwischen den anderen kontrollierten Flügen anzuwenden bis er BTC2937 nach der Übergabe von München ACC an Zürich ACC forschriftsmäßig identifiziert hatte, was aber anscheinend nicht stattfand.

Comment 8.7.3.7

This rule allowed the air traffic controller to continue to apply radar separation minima between other controlled flights until BTC 2937 had been properly identified after the transfer from München ACC to Zürich ACC, which apparently was never done.

42	8-11	8.7.4	Radar Separation Minima
		8.7.4.1	Unless otherwise prescribed in accordance with 8.7.4.2, 8.7.4.3 or 8.7.4.4, or Chapter 6 with respect to independent and dependent parallel approaches, the horizontal radar separation minimum shall be 9.3 km (5.0 NM).

Kommentar 8.7.4.1

Abweichend von dieser Norm waren zur Zeit des Unfalls seitens SKYGUIDE anstatt 5 NM 7 NM Radar-Mindest-Staffelung vorgeschrieben.

Comment 8.7.4.1

In deviating from this norm 7 NM minimum radar separation instead of 5 NM had been prescribed by SKYGUIDE at the time of the accident.

43	8-14	8.8.2	Collision Hazard Information
		8.8.2.1	When an identified controlled flight is observed to be on a conflicting path with an unknown aircraft deemed to constitute a collision hazard, the pilot of the controlled flight shall, whenever practicable: a) be informed of the unknown aircraft and if so requested by the controlled flight or, if in the opinion of the radar controller the situation warrants, a course of avoiding action should be suggested; and b) be notified when the conflict no longer exists.

Kommentar 8.8.2.1

Diese Regel traf nicht zu, da beide beteiligten Flugzeuge "bekannten" Verkehr darstellten.

Comment 8.8.2.1

This rule did not apply, since both flights constituted "known traffic".

44	8-14	8.8.2.3	Information regarding traffic on a conflicting flight path should be given, whenever practicable, in the following form: a) relative bearing of the conflicting traffic in term s of the 12-hour clock; b) distance from the conflicting traffic in km (NM); c) direction in which the conflicting traffic appears to be proceeding;

d) level and type of aircraft or, if known, relative speed of the conflicting traffic, e.g. slow or fast.

Kommentar 8.8.2.3

Die Verkehrsinformation an BTC2937 wurde in Bezug auf Regel 8.8.2.3 falsch gegeben, indem die andere Maschine nicht korrekt in 11-Uhr Position, sondern fälschlicherweise in 2-Uhr Position genannt wurde. Dadurch wurde der Pilot der BTC2937 verleitet, auch noch im Sinkflug direkt in den Konfliktkurs hinein zu drehen.

Comment 8.8.2.3

The traffic information to BTC 2937 with reference to rule 8.8.2.3 was not given correctly with the other aircraft in the 11 o´clock position, but erraneously in the 2 o´clock position. This caused the pilot of BTC 2937 to additionally turn into the conflicting course during his descent.

45 8-15 8.8.4.2 Radar Equipment Failure

As an emergency measure, use of flight levels spaced by half the applicable vertical separation minimum may be resorted to temporarily if standard non-radar separation cannot be provided immediately.

Kommentar 8.8.4.2

Eine solche Stiuation bestand nicht.

Comment 8.8.4.2

Such a situation did not exist.

46 15-9 15.6 Other ATC Contingency Procedures

15.6.1 Emergency Separation

15.6.1.1 If, during an emergency situation, it is not possible to ensure that the applicable horizontal separation can be maintained, emergency separation of half the applicable vertical separation minimum may be used, i.e. 150 m (500 ft) between aircraft in airspace where a vertical separation of 300 m (1 000 ft) is applied, and 300 m (1 000 ft) between aircraft in airspace where a 600 m (2 000 ft) vertical separation minimum is applied.

Kommentar 15.6.1

Eine mögliche Anwendung dieser Regel wurde durch die Sinkflug-Anweisung auf Flugfläche 350 an BTC2937 gegenstandslos.

Comment 15.6.1

A possible application of this rule became meaningless by the instruction to BTC 2937 to descend to flight level 350.

47 15.6.2 Short-term Conflict Alert (STCA) Procedures

Note 1
The generation of short term conflict alerts Is a function of an ATC radar data processing system. The objective of the STCA function is to assist the controller in maintaining separation between controlled flights by generating, in

a timely manner, an alert of a potential infringement of separation minima.

Note 2
In the STCA function the radar-derived current And predicted three-dimensional positions of transponder-equipped aircraft with Mode C capability are monitored for proximity. If the distance between the three-dimensional positions of two aircraft is predicted to be reduced to less than the defined applicable separation minima within a specified time period, an acoustic and/or visual alert will be generated to the radar controller within whose jurisdiction area the aircraft is operating.

Kommentar 15.6.2

Die Anwendung dieser Regel wurde durch die Nicht-Verfügbarkeit der STCA - Funktion gegenstandslos.

Comment 15.6.2

The application of this rule became impossible by the non-availability of the STCA - function.

48 15-10 15.6.3 Procedures in regard to Aircraft equipped with Airborne Collision Avoidance Systems (ACAS)

15.6.3.1 The procedures to be applied for the provision of air traffic services to aircraft equipped with ACAS shall be identical to those applicable to non-ACAS equipped aircraft. In particular, the prevention of collisions, the establishment of appropriate separation and the information which might be provided in relation to conflicting traffic and to possible avoiding action shall conform with the normal ATS procedures and shall exclude consideration of aircraft capabilities dependent on ACAS equipment.

Kommentar 15.6.3.1

In Anlehnung an die TCAS Verfahren für Flugzeugführer, niedergelegt im ICAO Dokument PANS-OPS (8168), macht diese PANS-ATM Regel des Dokuments 4444 für den Flugverkehrskontrolldienst deutlich, daß das Vorhandensein von TCAS in Flugzeugen (nicht für alle vorgeschrieben: Ausnahmen LFZ mit weniger als 30 Sitzen, Luftfahrzeuge unter 15 t Gewicht, militärische Luftfahrzeuge, usw.) unter keinen Umständen bei der Erstellung von vorgeschriebener Staffelung zwischen kontrollierten Flügen durch die Flugverkehrskontrolle und zur Vermeidung von Kollisionen in Betracht gezogen werden darf. Bis auf wenige Verfahrensausnahmen (hauptsächlich zu den Anflug-Kontroll-Verfahren) ist es ausschließlich Aufgabe der Flugverkehrskontrolle Staffelung zwischen kontrollierten Flügen zu erstellen und aufrechtzuerhalten. Diese Aufgabe wurde nicht und ist nicht nur teilweise an die verantwortlichen Luftfahrzeugführer auf Flugzeugen mit oder ohne TCAS delegiert. Deren Verpflichtung, erkennbaren Zusammenstoß-Gefahren zu begegnen und ihrerseits Kollisionen mit anderen erkennbaren Flugzeugen zu vermeiden, bleibt hiervon unberührt. Die Verpflichtung der Flugverkehrs-Kontrollstellen wird hierdurch in keinem Maße verringert und der Versuch, eine solche auf Piloten von Flugzeugen, die mit TCAS ausgerüstet sind, zu übertragen, ist zu keiner Zeit seitens der ICAO geschehen, geschweige denn von Piloten zu akzeptieren, da ihnen somit Aufgaben der Flugverkehrskontrolle und dementsprech-ende Verantwortung übertragen würden, für die sie nicht haften können und sollen. Wenn nationale Behörden gegensätzliche Regeln entscheiden, verletzen diese die von ihnen zuvor ratifizierten ICAO Regeln. In diesem Zusam-menhang muß die von EUROCONTROL am 2. 7. 2002 herausgegebene Presse-Information (Mid-Air Collision over Germany - Fußnote zu ACAS) inhaltlich als falsch bezeichnet werden. Der Kommentator hat EUROCONTROL hierauf hingewiesen. Desgleichen enthält der zu diesem Unfall gesendete ZDF Bericht "Tod über den Wolken" sachlich falsche Aussagen seitens dreier Personen.

Comment 15.6.3.1

With reference to the TCAS procedures for pilots, laid down in ICAO document PANS-OPS (8168), this PANS-ATM rule of document 4444 for the air traffic control service makes clear that the equipage of aircraft with TCAS (not prescribed for all: exceptions are aircraft with less than 30 seats, aircraft below 15 t weight, military aircraft, etc.) shall under no circumstances be considered by air traffic control in the establishment of prescribed separation between controlled flights and in the avoidance of collisions.

Only for a few exceptions from the procedures (mainly in the area of approach control) it is the duty of the air traffic control service to establish and maintain separation between controlled flights. This duty is not even partly being delegated to pilots in command on aircraft equipped or not equipped with TCAS.

Their responsibility for the detection of dangerous conflict situations and the avoidance of collisions with other aircraft remains unchanged. The obligation of air traffic control units is not being reduced at all hereby and the intention to transfer such to pilots of aircraft, which are TCAS equipped, has at no time been intended by ICAO, nor accepted by pilots, since this would mean to transfer the duties of air traffic control and corresponding responsibility, for which they can not and should not become responsible, into the cockpit of aircraft. Should national authorities decide on contradictory rules, these would violate ICAO rules, which they previously ratified.

In this connection the EUROCONTROL press release of 2 July 2002 (Mid-Air Collision over Germany - footnote on ACAS) must be called incorrect. The commentator has informed EUROCONTROL accordingly. In likewise manner the German ZDF TV-report on the accident "Death above the Clouds" contains technically wrong statements on behalf of three inter-viewed persons, including the chief accident investigator.

15.6.3.2 When a pilot reports a manoeuvre induced by an ACAS resolution advisory (RA), the controller shall not attempt to modify the aircraft flight path until the pilot reports returning to the terms of the current ATC instruction or clearances but shall provide traffic information as appropriate.

15.6.3.3 Once an aircraft departs from its clearance in compliance with a resolution advisory, the controller ceases to be responsible for providing separation between that aircraft and any other aircraft affected as a direct consequence of the manoeuvre induced by the resolution advisory. The controller shall resume responsibility for providing separation for all the affected aircraft when:

a) the controller acknowledges a report from the flight crew that the aircraft has resumed the current clearances; or

b) the controller acknowledges a report from the flight crew that the aircraft is resuming the current clearance and issues an alternative clearance which is acknowledged by the flight crew.

15.6.3.4 ACAS can have a significant effect on ATC. Therefore the performance of ACAS in the ATC environment should be monitored.

15.6.3.5 Following an RA event, or other significant ACAS Event, pilots and controllers should complete an air traffic incident report.

Note 1
The ACAS capability of an aircraft may not be known to air traffic controllers.

Note 2
Operating procedures for use of ACAS are contained in PANS-OPS (Doc 8168), Volume I, Part VIII, Chapter 3.

Note 3
The phraseology to be used by controllers and pilots is contained in Chapter 12, 12.3.1.2.

Allgemeine Schlußfolgerung

Die Entwicklung der Konfliktsituation zwischen DHX611 und BTC2937 und der daraus erfolgende Zusammenstoß hätten sich leicht vermeiden lassen, wenn der Flugverkehrsleiter den Flug BTC2937 vorschriftsmäßig identifiziert und unter Anwendung von Vertikalstaffelung auf Flugfläche 370 hätte steigen lassen, oder aber DHX611anstatt auf Flugfläche 360 nur auf Flugfläche 350 hätte steigen lassen. Diese einfache Lösung wurde aber nicht gewählt, da er anscheinend die gegebene Situation gar nicht erkannte oder sie ihn aber durch andere ablenkende Arbeit (Anflug auf Friedrichshafen) überforderte. Zudem wäre es zum Zeitpunkt der Sinkflugfreigabe auf Flugfläche 350 an BTC2937 mehr als ratsam gewesen, gleichzeitig eine entsprechende Verkehrsinformation an den Flug DHX611 zu geben oder noch besser, den Flug DHX611 gleichzeitig vom Kurs wegzudrehen und weiter steigen zu lassen, da dieser ja von ihm zuvor schon identifiziert worden war.

Für den Kommentator liegt grobe Fahrläßigkeit und mangelnde fachliche Kompetenz seitens des Flugverkehrsleiters diesem Unfall zugrunde.

General Conclusion

The development of the conflict situation between DHX 611 and BTC 2937 and the resulting collision could have easily been avoided, if the air traffic controller had properly identified flight BTC 2937 and in application of vertical separation let it climb to flight level 370, or alternatively hereto had DHX 611 climb to flight level 350 only instead of 360. This easy solution was however not chosen, since he apparently did not recognize the given situation or his other distracting duties (arrival to Friedrichshafen) demanded too much of him. On the other hand it would have been more than advisable to issue a corresponding traffic information to flight DHX 611 at the time of issuance of the descent clearance for BTC 2937 to flight level 350, or even better, to turn flight DHX 611 away from its course and have it climb further, since it was previously being identified by himself.

For this commentator the air traffic controller acted in gross negligence and demonstrated lacking professional competence.

ANSA + AIRADIO
Frank W Fischer
24 Jan 2004

REFERENCES TO ICAO ANNEXES AND DOCUMENTS
on the
RESPONSIBILITY OF ATS PROVIDERS
for the
ESTABLISHMENT AND MAINTENANCE OF STANDARD SEPARATION BETWEEN CONTROLLED FLIGHTS

C ICAO Annex 2 (Rules of the Air) References

No.	page	para.	Subject
1	6	2.1	Territorial Application of the Rules of the Air
		2.1.1	**The rules of the air shall apply to aircraft bearing the nationality and registration marks of a Contracting State, wherever they may be,** to the extent that they do not conflict with the rules published by the State having jurisdiction over the territory overflown.

Kommentar 2.1.1

Diese Regel traf auch auf die Flugzeugbesatzung des Fluges BTC2937 zu.

Comment 2.1.1

This rule also proves correct for the crew of flight BTC 2937.

2	6	2.2	Compliance with the Rules of the Air
		2.2.b	**The operation of an aircraft either in flight or on the movement area of an aerodrome shall be in compliance with the general rules and,** addition, **when in flight,** either with: a) the visual flight rules, or b) **the instrument flight rules**

Kommentar 2.2.b

Im Fall "Überlingen" war die Regel 2.2.b zutreffend, d.h. beide Flüge flogen unter IFR und somit unter voller Kontrolle des Flugverkehrskontrolldienstes.

Comment 2.2.b

In the "Überlingen" case rule 2.2.b applied, i.e. both flights operated under IFR and therefore under full control of the air traffic control service.

3	6	2.3	Responsibility for Compliance with the Rules of the Air
		2.3.1	Responsibility of pilot-in-command **The pilot-in-command of an aircraft** shall, whether manipulating the controls or not, be responsible for the operation of the aircraft in accordance with the rules of the air, ex-

cept that the pilot-in-command **may depart from these rules in circumstances that render such departure absolutely necessary in the interests of safety.**

Kommentar 2.3.1

Im Fall "Überlingen" machte die Flugzeugbesatzung des Fluges BTC2937 von diesem Recht zur Abwehr der drohenden Zusammenstoß-Gefahr Gebrauch.

Comment 2.3.1

In the "Überlingen" case the crew of flight BTC 2937 made use of their right for the aversion of the imminent danger of collision.

4	6	2.4	Authority of pilot-in-command of an Aircraft **The pilot-in-command of an aircraft shall have final authority as to the disposition of the aircraft while in command.**

Kommentar 2.4

Siehe den diesbezüglichen Kommentar zu Punkt 3.

Comment 2.4

See the respective comment on item 3.

5	8	3.2.2	Right-of-Way The aircraft that has the right-of-way shall maintain its heading and speed, but **nothing in these rules shall relieve the pilot-in-command of an aircraft from the responsibility of taking such action, including collision avoidance manoeuvres based on resolution advisories provided by ACAS equipment, as will best avert collision.** Note 1 Operating procedures for use of ACAS are contained in PANS-OPS (Doc 8168), Volume I, Part VIII, Chapter 3.

Kommentar 3.2.2

Diese Richtlinie verpflichtet den verantwortlichen Luftfahrzeugführer, jedwelche Aktion zu unternehmen, die eine Kollision verhindert, einschließlich von ACAS Ausweich-Manövern auf der Grundlage von TCAS - RAs. Im Fall "Überlingen" mußte der Luftfahrzeugführer des Fluges BTC2937 davon ausgehen, daß der Flugverkehrsleiter die bessere Gesamtübersicht über die gegebene Situation hatte, und daß es aus diesem Grunde ratsam war, dessen Sinkfluganweisung zu folgen, insbesondere da auf der Funkfrequenz bis zu diesem Zeitpunkt keine anderen Meldungen zwischen dem Flug DHX611 und Zürich ACC ausgetauscht worden waren. BTC2937 konnte also bis dahin gar nicht wissen, daß ein anderes Flugzeug, welches auch mit TCAS ausgerüstet war und eine RA befolgte, sich ebenfalls in Flugfläche 360 auf Kollisionskurs bewegte. Im übrigen galt in der Russischen Föderation für Luftfahrzeugführer die Regel, den Anweisungen der Flugverkehrskontrolle Vorrang zu geben.

Comment 3.2.2

This standard obliges the pilot in command to take whatever action for the avoidance of a collision, including ACAS avoidance manoeuvres on the bases of TCAS - RAs. In the "Überlingen" case the pilot of flight BTC 2937 had to consider that the air traffic controller had the better picture over the given situation and that it would be advisable for this reason to follow his descent instruction, especially since no other messages had been exchanged between flight DHX 611 and Zürich ACC until that moment. BTC 2937 for this reason could not know about any other TCAS equipped flight also

following an RA up to this moment in time, which also occupied flight level 360 on a collision course. Apart herefrom the rule to give preference to air traffic control instructions applied in the Russian Federation.

6	12	3.6	Air Traffic Control Service
		3.6.1	Air Traffic Control Clearances
		3.6.1.1	An air traffic control clearance shall be obtained prior to operating a controlled flight, or a portion of a flight as a controlled flight. Such clearance shall be requested through the submission of a flight plan to an ATC unit.

Kommentar 3.6.1.1

Beide Flüge befolgten diese Regel des Flugverkehrskontrolldienstes.

Comment 3.6.1.1

Both flights complied with this rule of the air traffic control service.

7	12	3.6.2	Adherence to Flight Plan
		3.6.2.1	Except as provided for in 3.6.2.2 and 3.6.2.4, **an aircraft shall adhere to the current flight plan** or the applicable portion of a current flight plan **submitted for a controlled flight unless a request for a change has been made and clearance obtained from the appropriate ATC unit**, or **unless an emergency situation arises which necessitates immediate action by the aircraft,** in which event as soon as circumstances permit, after such emergency authority is exercised, the appropriate air traffic services unit shall be notified of the action taken and that this action has been taken under emergency authority.

Kommentar 3.6.2.1

Diese Regel hätte den Luftfahrzeugführern beider Flüge erlaubt, von den ihnen gegebenen Flugverkehrs-Kontroll-Freigaben abzuweichen. Flug DHX611 konnte ebenfalls nichts von dem auf Kollisionskurs befindlichen Flug BTC2937 wissen, da nach der Anweisung des Flugverkehrsleiters um 21:30:33 Uhr an BTC2937, SSR Kode 7520 zu senden, keinerlei Meldungen bis 21:34:49 auf dieser Frequenz ausgetauscht wurden.

Comment 3.6.2.1

This rule would have allowed the pilots of both flights to deviate from the air traffic control clearances issued to them. Flight DHX 611 also could not know about flight BTC 2937 on its collision course since no other messages had been exchanged until 21:34:49 hours on that frequency after 21:30:33 hours when BTC 2937 was instructed to transmit SSR code 7520.

8	14	3.6.5	Communications
		3.6.5.1	An aircraft operated as a controlled flight shall maintain continuous air-ground voice communication watch on the appropriate communication channel of, and establish two-way communication as necessary with, the appropriate ATC unit, except as may be prescribed by the appropriate ATS authority in respect of aircraft forming part of aerodrome traffic at a controlled aerodrome.

Kommentar 3.6.5.1

Beide Flugzeuge hielten diese Regel ein. Der Flugverkehrsleiter, hierzu ebenso durch ICAO Anhang 10 Richtlinie verpflichtet, dahingegen nicht.

Comment 3.6.5.1

Both flights complied with this rule. The air traffic controller however, also obliged to do so by ICAO Annex 10 standard, did not.

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D ICAO Annex 10 Vol.II(Aeronautical Telecommunication) References

No.	page	para.	Subject
1	5-11	5.2.2.1.1.4	Establishment and Assurance of Communications Communications Watch **The user of the air-to-air VHF communications channel shall ensure that adequate watch is maintained on designated ATS frequencies,** the frequency of the aeronautical emergency channel, and any other mandatory watch frequencies.

Kommentar 5.2.2.1.1.4

Diese ICAO Richtlinie scheint vom Flugverkehrsleiter für Frequenz 128.050 (Zürich ACC Süd Sektor S/RE) nicht dauernd befolgt worden zu sein. Es bleibt somit den Unfalluntersuchungsstellen überlassen, festzustellen, wie lange der Flugverkehrsleiter den Arbeitsplatz des oberen Luftraums verlassen hatte und somit weder Hörbereitschaft auf 128.050 aufrechterhalten, noch die Identifizierung des Fluges BTC2937 vervollständigen konnte, womit die Möglichkeit Radar-Kontrollverfahren auf die beiden Flüge anzuwenden, gegenstandslos wurde. Nach der Sprechfunk-Umschrift dauerte die Abwesenheit von diesem Arbeitsplatz etwa 4 Minuten.

Comment 5.2.2.1.1.4

This ICAO standard, apparently, was not continuously complied with by the air traffic controller for frequency 128.050 (Zürich ACC South Sector S/RE). It therefore remains to be the duty of the accident investigation units to determine for how long the air trafffic controller had vacated the working position for the upper airspace and had thereby neither maintained listening watch on 128.050, nor completed the identification of flight BTC 2937, making the application of radar control procedures on both flights devoid. According to the radio telephony transcript the absence from this working position lasted for about 4 minutes.

2	5-11	5.2.2.1.2	**Aeronautical stations shall maintain watch as required by the appropriate Authority.**

Kommentar 5.2.2.1.2

Siehe Kommentar zu Punkt 1.

Comment 5.2.2.1.2

See comment on item 1.

3	5-12	5.2.2.1.4	**When it is necessary for an** aircraft station or **aeronautical station to suspend operation for any reason, it shall, if possible, so inform other stations concerned,** giving the time at which it is expected that operation will be resumed. When operation is resumed, other stations concerned shall be so informed.

Kommentar 5.2.2.1.4

Diese Richtlinie wurde für den Fall der 4 minütigen Abwesenheit vom Arbeitsplatz des oberen Luftraums (S / RE mit Frequenz 128.050) missachtet.

Comment 5.2.2.1.4

This standard was violated for the case of the 4-minute absence from the working position of the upper airspace (S/RE with frequency 128.050).

4	5-12	5.2.2.1.5	*Recommendation* When two or more ATS frequencies are being used by a controller, consideration should be given to providing facilities to allow ATS and aircraft transmissions on any of the frequencies to be simultaneously retransmitted on the other frequencies in use thus permitting aircraft stations within range to hear all transmissions to and from the controller.

Kommentar 5.2.2.1.5

Es entzieht sich der Kenntnis des Kommentators, ob diese technische Einrichtung der Frequenz-Kopplung bei Zürich ACC vorhanden ist, bzw. war. Für den Fall, daß diese Möglichkeit bestand, hätte der Flugverkehrsleiter die Frequenz 128.050 mit der Frequenz 119.920 koppeln sollen.

Comment 5.2.2.1.5

It is not known to this commentator whether this technical feature of frequency coupling is, respectively was available at Zürich ACC. In case this possibility existed, the air traffic controller would have had to couple frequency 128.050 with frequency 119.920.

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E ICAO Document 8168 (PANS-OPS) References

No.	page	para.	Subject
1	8-4	Cpt 3	Operation of ACAS Equipment
		3.1	General
		3.1.1	The information provided by airborne collision avoidance systems (ACAS) is **intended to assist pilots** in the safe operation of aircraft.

Kommentar 3.1.1

Die Regel unter 3.1.1 verdeutlicht, daß die von ACAS Systemen gelieferten Informationen lediglich zur Unterstützung der Piloten in der sicheren Führung von Luftfahrzeugen dienen.

Comment 3.1.1

The rule under 3.1.1 makes clear that the information provided by ACAS systems solely serves the pilots in assisting them in the safe operation of aircraft.

2	8-4	3.1.2	**Nothing in the procedures specified in 3.2 hereunder shall prevent pilots-in-command from exercising their best judgement and full authority in the choice of the course of action to resolve a traffic conflict.**

Kommentar 3.1.2

Diese Regel verdeutlicht das Recht der Piloten auf volle Autorität in der Wahl von Ausweichmanövern zur Vermeidung von Konflikten mit anderen Flügen. Auch hebt diese Regel nicht die Empfehlung an die Luftfahrzeugführer, in bestimmten Regionen den TCAS - RAs Vorrang vor Anweisungen der Flugverkehrskontrolle zu geben, auf. Dort heißt es zumeist RAs "sollen" und nicht "müssen" vorrangig befolgt werden.

Comment 3.1.2

This rule makes clear the right of pilots on full authority in the selection of evasive manoeuvres for the avoidance of conflicts with other flights. This rule also does not suspend the recommendation to pilots to give preference to TCAS - RAs before air traffic control instructions in certain regions. There, in most cases, it says RAs "should" and not "must" be followed with precedence.

3	8-4	3.2	Use of ACAS Indications
			ACAS indications are intended to assist the pilots in the active search for, and visual acquisition of, the conflicting traffic, and the **avoidance of potential collisions.** The indications generated by ACAS shall be used by pilots in conformity with the following safety considerations:

a) pilots shall not manoeuvre their aircraft in response to traffic advisories only;

Note 1
Traffic advisories are intended to assist in visual acquisition of conflicting traffic and to alert the pilot to the possibility of a resolution advisory.

Note 2
The above restriction in the use of traffic advisories is due to the limited bearing accuracy and to the difficulty in interpreting altitude rate from displayed traffic information.

b) in the event of a resolution advisory to alter the flight path, the search for the conflicting traffic shall include a visual scan of the airspace into which own ACAS aircraft might manoeuvre;

c) the alteration of the flight path shall be limited to the minimum extent necessary to comply with the resolution advisories;

d) pilots who deviate from an air traffic control instruction or clearance in response to a resolution advisory shall promptly return to the terms of that instruction or clearance when the conflict is resolved and shall notify the appropriate ATC unit as soon as practicable, of the deviation, including its direction and when the deviation has ended.

Note
The phraseology to be used for the notification of manoeuvres in response to a resolution advisory is contained in the PANS-RAC (Doc 4444), Part X, 3.1.2. (Reporter´s Note: That is the former edition of PANS-ATM Doc 4444.)

Kommentar 3.2

Regel 3.2 betont den Zweck der ACAS Anzeigen an die Piloten, nämlich zur Unterstützung zu dienen. Die Aufgabe der Flugverkehrskontrolle, Staffelung zu erstellen und aufrechtzuerhalten, bleibt nämlich unberührt.

Comment 3.2

Rule 3.2 emphasizes the purpose of ACAS indications to pilots, namely to serve for their assistance. The duty of air traffic control to establish and maintain separation, remains untouched.

Schlußfolgerung

Für eine Schuldzuweisung im Fall "Überlingen" kann aufgrund der bekannt gewordenen Umstände nicht auf die Handlungsweise der Piloten zurückgegriffen werden, da eine übergeordnete Verantwortlichkeit seitens der Flugverkehrskontrolle gegeben ist. Da ACAS (TCAS) nicht die Flugverkehrskontrolle ersetzen kann und soll, sondern nur als letzte Warnung an den Piloten über eine bestehende Kollisionsgefahr dienen soll, kann ein mögliches Fehlverhalten zu dem Zweck der technischen TCAS - Funktionen nicht für ein Außerachtlassen der gegebenen Verantwortlichkeit der Flugverkehrskontrolle herangezogen werden. Dies würde die Aufgabenstellung der Flugverkehrskontrolle weltweit ad

absurdum führen.

Concluding Comment

For the blame of someone in the "Überlingen" case one cannot refer to the course of action of the pilots due to the circumstances, which became known, since there exists a responsibility on behalf of the air traffic control service placed above the pilots responsibility. And since ACAS (TCAS) cannot and shall not replace air traffic control, but shall only serve as a last warning to pilots on an existing danger of collision, a possible non-adherence to technical TCAS functions cannot be used in defence for the failure of fulfilling air traffic control responsibilities. This would lead the objectives of air traffic control ad absurdum.

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F ICAO Document 7030 (Regional Supplementary Procedures) References

No.	page	para.	Subject
1			Document 7030 under para. 20 did not and still does not contain any changes to the provision regarding the operation of ACAS as were current in 2002 and contained in ICAO Annexes and Documents 4444 and 8168. F. W. Fischer, ANSA

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G Swiss ATMM (Air Traffic Management Manual) References

No.	sect.	para.	Subject
1	1	4.1	WARNING Kommentar Auf den Fall Überlingen bezogen, enthielt das Schweizer ATMM (Air Traffic Management Manual = Betriebshandbuch für die Flugverkehrsdienste) auf dem Stand der Berichtigung Nr. 20 vom 1.6.2002 für den Zeitpunkt des Unfalls keine relevanten Abweichungen zu den anzuwendenden ICAO Richtlinien und Verfahren. Anmerkung: Das Schweizer ATMM wird nur in englischer Sprache betrieben.
1	*1*	*4.1*	*WARNING* *Comment* *With reference to the "Überlingen" case the Swiss ATMM (Air Traffic Management Manual for the provision of air traffic services) including its amendment number 20 and current as of 1 June 2002 did not contain any relevant deviations on the applicable ICAO standards and procedures at the time of the accident. Note: The Swiss ATMM has been published only in the English language.*
2	1	4.2	CONTENTS Kommentar Das Betriebshandbuch enthält die ATM Betriebsverfahren, die von Flugverkehrsleitern und Flugdatenbearbeitern anzuwenden sind. Entsprechend den Aufgaben ihrer Pflichtenbeschreibungen ist das ATM Personal gehalten, mit den Regeln des Betriebshandbuches, die sich auf ihre betrieblichen Verantwortlichkeiten beziehen, vertraut zu sein und auf darin nicht gedeckte Fälle ihr '"best judgement" anzuwenden. Diese Aufgabe wurde am 1.7.2002 vom zuständigen Flugverkehrsleiter nicht erfüllt.
2	*1*	*4.2*	*CONTENTS* *Comment* *The operations manual contains the ATM operations procedures, which are to be applied by air traffic controllers and flight data assistants. According to the activities listed in their duty statement (job description), ATM operators are required to be familiar with those provisions of the manual which pertain to their operational responsibility and to exercise their best judgement if they encounter situations which are not covered by it. This duty has not been fulfilled by the assigned air traffic controller on 1 July 2002.*
3	1	4.3	LEGAL SOURCES Kommentar Diese Information bestätigt die Gültigkeit der ICAO Richtlinien und Verfahren für die Schweiz.
3	*1*	*4.3*	*LEGAL SOURCES* *Comment* *The procedures laid down in the manual are based upon: a) the provisions of Swiss legislation, including guidelines and decisions by the Fedeal Office of Civil Aviation (FOCA), and b) ICAO standards, recommended practices and procedures for Air Navigation Services, etc.This information acknowledges the validity of the ICAO standards and procedures for Switzerland.*
4	1	4.4	STATUS Kommentar Das ATM Personal muß die in diesem Handbuch enthaltenen Regeln anwenden.

4	*1*	*4.4*	*STATUS* *Comment* *ATM operators (i.e. air traffic services personnel) shall apply the provisions of the manual.*
5	1	4.5	GEOGRAPHICAL SCOPE Kommentar Die im Betriebshandbuch enthaltenen Regeln treffen ebenso auf die Leistung von Flugsicherungsdiensten an Flugzeuge in fremdem, an die Schweiz delegierten, Luftraum zu.
5	*1*	*4.5*	*GEOGRAPHICAL SCOPE* *Comment* *The rules contained in the operations manual are also applicable on the provision of air traffic services to aircraft in foreign airspace as delegated to Switzerland.*
6	1	11	DIFFERENCES FROM ICAO Kommentar Die unter § 11 für die Schweiz vom schweizer Bundesamt für Zivilluftfahrt (BAZL / FOCA) genehmigten Ausnahmen zu den Staffelungsverfahren des ICAO Dokuments 4444 betreffen keine auf den Fall Überlingen anwendbaren Regeln.
6	*1*	*11*	*DIFFERENCES FROM ICAO* *Comment* *It says "The provisions of the manual apply to the provision of services to aircraft in foreign airspace where the responsibility for the provision of such services has been delegated to Switzerland..."* *The deviations from the separation procedures of ICAO document 4444 as approved by the Swiss Federal Office for Civil Aviation (FOCA) do not refer to any of the rules applicable to the Überlingen case.*
7	2	1.1.1	REQUIREMENT TO HOLD A LICENCE WITH VALIDATED RATINGS Kommentar Die Ausübung von Flugverkehrskontrolldienst-Funktionen erfordert eine Flugverkehrskontrolldienst-Lizenz mit entsprechenden gültigen Zulassungen; d.h. für die verschiedenen zu betreibenden Arbeitsplätze. Die Lizenzträger sind dafür verantwortlich, daß die in ihren Lizenzen enthaltenen Zulassungen gültig sind und sie ermächtigen, alle Funktionen auszuüben, die unter die Aufgaben eines von ihnen betriebenen Arbeitsplatzes fallen.
7	*2*	*1.1.1*	*REQUIREMENT TO HOLD A LICENCE WITH VALIDATED RATINGS* *Comment* *It says: "The performance of air traffic control service functions requires an air traffic controller licence with the appropriate validated rating(s)" , i.e. for the different working positions to be operated. The licence holders are responsible that the ratings on their licences are valid and entitle them to exercise all functions, which refer to the duties of an occupied working position.*
8	2	3	PHYSIOLOGICAL CONSIDERATIONS Kommentar Es heißt " Üben Sie keine der in diesem Handbuch enthaltenen Aktivitäten aus, wenn Sie sich nicht physisch oder psychologisch fit fühlen, diese auch ausüben zu können."
8	*2*	*3*	*PHYSIOLOGICAL CONSIDERATIONS* *Comment* *It says "Do not exercise any of the activities contained in the manual, if you do not feel fit physically or psychologically to actually do so".*
9	2	4.1	BRIEFING Kommentar Es heißt "Informieren Sie sich vor Beginn einer Arbeitsschicht über a) ... b) jedwelche bestehende oder zu erwartende ungewöhnliche Situation, welche besonderer Aufmerksamkeit bedarf oder die Anwendung gültiger Verfahren beeinflussen könnte; c) die Dienstbereitschaft aller zu benutzender Geräte, die für die Leistung der ATM Dienste relevant sind; d) ..." Die Aufgabe, zwei voneinander getrennte Arbeitsplätze besetzen zu müssen, stellt für den

Kommentator eine ungewöhnliche Situation dar.

9 2 4.1 BRIEFING
Comment
It says
"Before starting your daily shift, inform yourself of:
a) ...
b) any existing or expected unusual situation which might require special attention or affect the application of current procedures;
c) the serviceability of all equipment to be used while providing the relevant ATM services;
d) ...
The duty of having to simultaneously occupy two working positions, which were physically separated, constitutes an unusual situation for the commentator.

10 2 4.3 WORKING POSITION OVERLOAD
Kommentar
Es heißt:
" Informieren Sie den Wachleiter, sobald die Arbeitslast Ihre eigene Kapazität zu übersteigen scheint und bitten Sie um Unterstützung."
Dies war am 1.7.2002 nicht möglich, da sich der diensttuende Flugverkehrsleiter nur allein im Betriebsraum befand.

10 2 4.3 WORKING POSITION OVERLOAD
Comment
It says: "Inform and request assistance from the watch supervisor as soon as workload in excess of your working capacity is anticipated." This was not possible on 1 July 2002, since the air traffic controller on duty was alone in the operations room.

11 2 4.4 JOINT RESPONSIBILITIES
Kommentar
Das Handbuch enthält unter § 4.4 eine Regel über gemeinsame Verantwortlichkeiten für den Fall, daß an einem Arbeitsplatz mehr als nur eine Person gleichzeitig eingesetzt ist. Es enthält dahingegen aber keine Regeln über die vorgeschriebene Verfahrensweise und Verantwortlichkeit für den Fall, daß nur ein einziger Flugverkehrsleiter an mehreren Arbeitsplätzen gleichzeitig eingesetzt ist.

11 2 4.4 JOINT RESPONSIBILITIES
Comment
The manual under para 4.4 contains a rule on joint responsibilities for cases when more than one person is assigned to one working position. It, however, does not contain any rules on the prescribed procedure and responsibility for the case in which only one air traffic controller has been assigned to several working positions simultaneously.

12 2 4.8 WATCH SUPERVISION
Kommentar
Die §§ 4.8.1 bis 4.8.3 regeln im einzelnen die Aufgaben des Wachleiters. Da dem Kommentator nicht bekannt ist, ob für die Nachtschicht vom 1.7.2002 ein Wachleiter eingesetzt war, bzw. wer von den beiden diensttuenden Flugverkehrsleitern die Aufgaben des Wachleiters in Vertretung übertragen bekommen hatte, erübrigt es sich, die Erfüllung bzw. Nicht- Erfüllung der Aufgaben des Wachleiters zu kommentieren. Sollte dahingegen einer der beiden Flugverkehrsleiter in Vertretung als Wachleiter bestimmt worden sein, so treffen alle Aufgaben des Wachleiters gemäß § 4.8.1 auch auf ihn zu. Sollte dies der Flugverkehrsleiter gewesen sein, der zum Zeitpunkt des Unfalls gerade Pause machte, so träfe ihn diese Verantwortung, d.h. die unter den Punkten 4.8.3.b, c, h, i, k und o aufgeführten Verpflichtungen.

12 2 4.8 WATCH SUPERVISION
Comment
Paras 4.8.1 to 4.8.3 regulate in detail the duties of the watch supervisor. Since it is not known to the commentator, whether a watch supervisor had been assigned to the night shift of 1 July, respectively who of the two air traffic controllers on duty had also been assigned the duty of the watch supervisor, it becomes superfluous to comment on the duties of the watch supervisor. Should, however, one of the two air traffic controllers have been assigned as watch supervisor, then all duties of the watch supervisor under para 4.8.1 also refer to him. Should this have been the air traffic controller, who at the time of the accident was on break, then this responsibility would refer to him, i.e. all duties as listed under para 4.8.3.b, c, h, i, k and o.

13	4	3.9	UPPER AIRSPACE Kommentar § 3.9 bestätigt die Luftraum-Klassifizierung C für den oberen Luftraum der Schweiz von Flugfläche 195 bis Flugfläche 600.
13	*4*	*3.9*	*UPPER AIRSPACE* *Comment* *Para 3.9 acknowledges airspace class C for the upper airspace of Switzerland from flight level 195 up to flight level 600.*
14	4	7.2.2	SUBSEQUENT (POSITION) REPORTS - RADAR CONTROLLED AIRCRAFT Kommentar Diese Regel gibt die Umstände wieder, die gegeben sein müssen bevor Flugzeugen unter Radarkontrolle erlaubt werden kann, von Positionsmeldungen an die Flugverkehrskontrolle abzusehen. Im Fall Überlingen wären die Voraussetzungen 7.2.2.a, b und c nicht gegeben gewesen.
14	*4*	*7.2.2*	*SUBSEQUENT (POSITION) REPORTS - RADAR CONTROLLED AIRCRAFTf* *Comment* *This rule states the conditions which have to be fulfilled before aircraft under radar control may be permitted to omit position reports to air traffic control. In the Überlingen case preconditions 7.2.2.a, b and c would not have been fulfilled.*
15	6	1	PREFERENCE FOR RADAR OVER NON-RADAR PROCEDURES Kommentar Die Regel unter § 1.e wurde nicht angewendet, obwohl ihre Befolgung unter den gegebenen Umständen die beste Lösung gewesen wäre. Sie lautet: "Wenden Sie -Nicht-Radar - Verfahren an, **e) in Situationen unter denen, beruhend auf ihrer Beurteilung, die Anwendung von Nicht- Radar -Verfahren einfacher, wirksamer oder beschleunigender mit Bezug auf das gewünschte Ergebnis ist (z.B. Anwendung von Vertikal-Staffelung anstatt horizontaler Radar-Staffelung)".**
15	*6*	*1*	*PREFERENCE FOR RADAR OVER NON-RADAR PROCEDURES* *Comment* *The rule under para 1.e had not been applied, whereas its obeyance would have been the best solution under the given circumstances. It reads:* *"Give preference to radar procedures over non-radar procedures. Use non-radar procedures:* ***e) in circumstances when, based on your judgement, application of non-radar procedures is simpler, more efficient or more expeditious with regard to the desired objective (e.g. application of vertical separation instead of horizontal radar separation)."***
16	6	2	LIMITATIONS IN THE USE OF RADAR Kommentar Diese Regel verlangt, daß nicht gleichzeitig Radardienste für eine größere Zahl von Flügen geleistet werden sollen, als man sicher bewältigen kann, indem in Betracht gezogen werden: a) die strukturelle Komplexität des betroffenen (Luftraum-) Kontrollbezirks oder Sektors; b) die Radar-Funktionen, die innerhalb dieses Kontrollbezirks oder Sektors zur Anwendung kommen sollen; c) Beurteilungen der Arbeitslast von Flugverkehrsleitern und Sektor-Kaxpazität.
16	*6*	*2*	*LIMITATIONS IN THE USE OF RADAR* *Comment* *This rule requires not to provide radar services simultaneously to a larger number of aircraft than one can safely handle, taking into account: a) the structural complexity of the control area or sector concerned; b) the radar functions to be performed within the control area or sector concerned; c) assessments of controller workloads and sector capacity; d) ...*
17	6	5.1	RADAR SERVICES AND RADAR FUNCTIONS Kommentar Diese Regel besagt, daß eine jede Art von Radardienst erst mit der Identifikation des betroffenen Flugzeugs beginnt. Dieser Vorgang war für den Flug BTC2937 nicht erfüllt.
17	*6*	*5.1*	*RADAR SERVICES AND RADAR FUNCTIONS* *Comment* *This rule says that each kind of radar service only commences with the identification of the*

aircraft concerned. This process had not been fulfilled for flight BTC 2937.

18 6 5.1.3 INTERRUPTION AND TERMINATION OF RADAR SERVICE
Kommentar
Diese Regel wurde für Flug DHX611 nicht beachtet.

18 6 5.1.3 INTERRUPTION AND TERMINATION OF RADAR SERVICE
Comment
This rule had not been complied with for flight DHX 611.

19 6 5.2 RADAR FUNCTIONS
Kommentar
Diese Regel verpflichtete den Flugverkehrsleiter, zwischen den Flügen DHX611 und BTC 2937 verfahrensmäßige Staffelung (Nicht-Radar) zu erstellen, falls Radarstaffelung nicht erstellt oder aufrechterhalten werden konnte, was nicht geschah.

19 6 5.2 RADAR FUNCTIONS
Comment
This rule obliged the air traffic controller to establish procedural (non-radar) separation between flights DHX 611 and BTC 2937, in case radar separation could not be established or maintained, which was not applied.

20 6 6 + 6.1 IDENTIFICATION OF AIRCRAFT / PRINCIPLE
Kommentar
Diese Regel wurde von Flugverkehrsleiter am 1.7.2002 völlig missachtet.

20 6 6 + 6.1 IDENTIFICATION OF AIRCRAFT / PRINCIPLE
Comment
It says: "... not performing a given radar function does not relieve you from any obligation to provide traffic information and / or separation by means other than radar, when and as traffic information and/or separation are required."
This rule was completely ignored by the air traffic controller on 1 July 2002.

21 6 6.2.7 LOSS OF RADAR IDENTIFICATION
Kommentar
Auch diese Regel der Radarkontrolle wurde vom Flugverkehrsleiter misachtet.

21 6 6.2.7 LOSS OF RADAR IDENTIFICATION
Comment
It says: "If you lose radar identification on one or more aircraft, immediately inform the pilot(s) concerned of that fact. Take any necessary action to re-establish non-radar separation, if required, including emergency separation measures. You must re-establish radar identifcation of the aircraft concerned before resuming the provision of any radar services to these aircraft."
Also this rule of radar control was ignored by the air traffic controller.

22 7 1.1 ISSUANCE OF ATC CLEARANCES
Kommentar
Die Regel unter " 1.1.a war eingehalten. Beide Flüge bewegten sich im Rahmen einer ihnen zuvor gegebenen Freigabe der Flugverkehrskontrolle; DHX611 der durch Zürich ACC gegebenen und BTC2937 der durch München ACC gegebenen Freigabe, die bis zum Zeitpunkt anderweitiger Anweisungen Gültigkeit behielt (= FL 360).

22 7 1.1 ISSUANCE OF ATC CLEARANCES
Comment
The rule under para 1.1.a had been adhered to. Both flights operated within the scope of a previously issued air traffic control clearance; DHX 611 on the basis of the clearance issued by Zürich ACC and BTC 2937 on the one issued by München ACC, which held valid until the time of issuance of differing instructions (= FL 360).

23 7 1.3 PILOT RESPONSIBILITY IN RESPECT OF CLEARANCE COMPLIANCE
Kommentar
Beide Flüge hielten sich an diese Regel.

23 7 1.3 PILOT RESPONSIBILITY IN RESPECT OF CLEARANCE COMPLIANCE
Comment
It says: "Compliance with an ATC clearance is compulsory". Both flights complied with

this rule.

24 7 3 + 3.1 SEPARATION OF AIRCRAFT / PROVISION
Kommentar
Diese Regel, Sätze 4 und 5, wurde vom Flugverkehrsleiter nicht eingehalten.

24 7 3 + 3.1 SEPARATION OF AIRCRAFT / PROVISION
Comment
It says: "Do not give a clearance to execute any manoeuvre that would reduce the spacing between two aircraft to less than the separation minimum applicable in the circumstances. When separation is required, apply: a) vertical separation; or b) horizontal separation, by providing: i) longitudinal separation; or ii) lateral separation. When the type of separation or minimum used to separate two aircraft cannot be maintained, take appropriate action to ensure that another type of separation or another minimum exists or is established befor the previously used separation becomes insufficient."
The air traffic controller did not comply with this rule.

25 7 3.4 ACTION IN CASE OF LOSS OF SEPARATION
Kommentar
Diese Regel wurde auf DHX611 nicht angewendet.

25 7 3.4 ACTION IN CASE OF LOSS OF SEPARATION
Comment
It says: "In case of loss of separation: a) issue essential traffic information to all aircraft concerned; and b) issue instructions to all aircraft concerned, to re-establish separation. If it is not possible to issue instructions which will establish standard separation immediately, emergency vertical separation of half the applicable vertical separation minima may be used temporarily." This rule was not applied on DHX 611.

26 7 3.6 RADAR SEPARATION
Kommentar
Satz 2 dieser Regeln wurde missachtet.

26 7 3.6 RADAR SEPARATION
Comment
It says: "Apply radar separation only between identifed aircraft when there is reasonable assurance that identification will be maintained." This rule was ignored by the air traffic controller.

27 7 3.7 RADAR SEPARATION MINIMA
Kommentar
Die unter Punkt 3.7.c.ii genannte Bedingung war am 1.7.2002 gegeben (= 7 NM).

27 7 3.7 RADAR SEPARATION MINIMA
Comment
It says: "The following radar separation minima apply whether using SSR radar and/or primary radar: a) ...; b) ...; c) when operating the ADAPT system: i) ..., ii) 7 NM ICWS indication: FALLBACK, iii) ...".
This condition (= 7 NM) applied in the night of 1 July 2002.

28 7 3.11.2.1 LONGITUDINAL SEPARATION BASED ON TIME FOR AIRCRAFT MAINTAINING THE SAME LEVEL
Kommentar
Die Regel 3.11.2.1.b.ii traf auf die Situation zwischen DHX611 und BTC2937 zu (= 10 Minuten).

28 7 3.11.2.1 LONGITUDINAL SEPARATION BASED ON TIME FOR AIRCRAFT MAINTAINING THE SAME LEVEL
Comment
It says: "a) aircraft flying on the same track ...; b) aircraft flying on crossing tracks: i) ..., ii) 10 minutes, if all relevant navigation aids specified in local procedures are serviceable..".
This basic rule was applicable on the situation between DHX 611 and BTC 2937 (= 10 minutes, respectively 5 minutes if the preceding aircraft is at least 20 kt faster).

29 7 3.11.2.4 LONGITUDINAL SEPARATION BASED ON TIME AND RADAR OBSERVED DISTANCE
Kommentar
Diese Regel zur 3-Minuten Längsstaffelung konnte nicht zur Anwendung kommen, da die Bedingung "a" nicht erfüllt werden konnte.

29 7 3.11.2.4 LONGITUDINAL SEPARATION BASED ON TIME AND RADAR OBSERVED DISTANCE
Comment
It says: "3 minutes between aircraft on the same track or crossing tracks whether at the same level, climbing or descending, provided that: a) you are continuously monitoring the flight progress by radar forming an integral part of your ATC unit; and b) the distance between the aircraft, as observed on radar, is never less than 20 NM".
This rule on 3-minute longitudinal separation could not be applied, since condition "a" could not be fulfilled.

30 7 5 TRAFFIC AVOIDANCE ADVICE
Kommentar
Diese Regel trifft nicht auf die Anweisung des Flugverkehrsleiters an BTC2937, auf Flugfläche 350 zu sinken, zu. Seine Anweisung bezog sich auf seine eigene Verpflichtung, Staffelung zu erstellen.

30 7 5 TRAFFIC AVOIDANCE ADVICE
Comment
It says: "Traffic avoidance advice is a recommendation regarding the manoeuvres which, in your opinion, are most likely to prevent any risk of collision, when two aircraft are flying in the vicinity of each other. On request of the pilot, issue traffic avoidance advice to IFR flights in respect of VFR flights in airspace Class D."...
This rule did not apply to the instruction of the air traffic controller to BTC 2937 to descend to flight level 350. His instructions referred to his own obligation to establish separation.

31 7 6 TCAS
Kommentar
Die im ATMM zu TCAS niedergelegten Regeln stimmen mit denen von der ICAO beschlossenen und veröffentlichen Regeln und Verfahren überein.

31 7 6 TRAFFIC COLLISION AVOIDANCE SYSTEM (TCAS)
Comment
The rules on TCAS as contained in the ATMM are conform to those concluded and published by ICAO.

32 7 6.1 GENERAL (TCAS) PROVISION
Kommentar
Die Erfüllung dieser TCAS Regel war zu keiner Zeit Gegenstand des Unfallhergangs, da der Flugverkehrsleiter zum Zeitpunkt der Sinkfluganweisung an BTC2937 gar nicht wissen konnte, ob BTC2937 oder DHX611 bereits auf eine TCAS - RA reagierten.

32 7 6.1 GENERAL (TCAS) PROVISION
Comment
It says: "The procedures to be applied for the provision of air traffic services to aircraft equipped with TCAS shall be identical to those applicable to non-TCAS equipped aircraft. In particular the prevention of collisions, the establishment of appropriate separations and the information which might be provided in relation to conflicting traffic and to possible avoiding action shall conform with the normal procedure and shall exclude consideration of aircraft capabilities dependent on TCAS equipment."
The compliance with this rule on TCAS was at no time during the course of the accident of any relevance, since the air traffic controller at the time of issuance of the descent clearance to BTC 2937 could not even know whether BTC 2937 or DHX 611 already reacted on a TCAS - RA.

6.2 Also, rule 6.2 says: "Pilots may not deviate from an ATC clearance on the basis of a traffic advisory only. Pilots are <u>entitled</u> to initiate collision avoidance manoeuvres based on resolution advisories provided by TCAS equipment. As such instructions apply to conflicts requiring immediate action, no prior advice from the pilot to ATC is required. When deviating from an ATC clearance on a TCAS instruction, the pilot is required to report the avoiding action as soon as possible. ....".
Nothing in this rule, which conforms to the wording of ICAO standards, recommended practices and procedures, obliges pilots to give TCAS - RAs obligatory preference to ATC instructions.

33	7	6.4	RESPONSIBILITY OF THE AIR TRAFFIC CONTROLLER Kommentar Aus dieser Regel kann und darf nicht geschlossen werden, daß der Flugverkehrsleiter der danach erfolgenden Information von DHX611, einer TCAS - RA zu folgen, keine weitere Verpflichtung zur Wiederherstellung von Mindeststaffelung zwischen den beiden Flugzeugen gehabt hätte. Er hat diese Information anscheinend ohnehin nicht mehr gehört**. Allerdings hätte er den Arbeitsplatz des oberen Luftraums unter keinen Umständen vorzeitig wieder verlassen dürfen, bis er sicher war, daß zwischen beiden Flügen wieder Mindeststaffelung bestand. Sein Verhalten ist als grob fahrlässig zu bezeichnen.**
33	*7*	*6.4*	*RESPONSIBILITY OF THE AIR TRAFFIC CONTROLLER* *Comment* *It says: "Once an aircraft has begun a manoeuvre in response to a TCAS resolution advisory (RA), you cease to be responsible for providing separation between that aircraft and any other aircraft affected, or for any other possible consequences (e.g. loss of obstacle clearance or infringement of airspace) of such manoeuvre(s). This means that you shall not be held responsible for any loss of separation resulting from a TCAS-induced collision avoidance manoeuvre, or for any other possible consequences of such manoevres. The responsibility for providing separation between all affected aircraft resumes when either: a) ..., b)...".* ***From this rule it may not be concluded that the air traffic controller had no obligation for the re-establishment of minimum separation between both aircraft after DHX 611 reported following a TCAS - RA. He apparently had not heard that report anyhow. However, he should not have vacated the working position of the upper airspace until he was sure that minimum separation had been re-established between both flights. His behaviour must be judged as gross negligent.***
34	12	3.4 + 3.4.1	ADDITIONAL PROVISIONS REGARDING THE HANDLING OF FLIGHT PLAN DATA BY ATS OPERATORS / GENERAL Kommentar Da dem Kommentator keinerlei Information darüber verfügbar ist, ob dem Flugverkehrsleiter eventuell keine Flugverlaufs-Kontrollstreifen für einen oder beide Flüge (DHX611 und BTC2937) vorlagen, wird davon ausgegangen, daß die Regel 3.4.1 von dem Flugdatenbearbeiter erfüllt wurde.
34	*12*	*3.4 + 3.4.1*	*ADDITIONAL PROVISIONS REGARDING THE HANDLING OF FLIGHT PLAN DATA BY ATS OPERATORS / GENERAL* *Comment* *It says: "Record flight plan information required by the type of flight plan and existing circumstances. Use authorized abbreviations when possible. Base messages concerning the intended or actual movement of aircraft on the latest information provided by the pilot or the aircraft operator, or derived from radar. ...".* *Since this commentator does not have any information whether no flight progress strips have been available to the air traffic controller on one or both flights (DHX 611 and BTC 2937), it is being assumed that rule 3.4.1 had been fulfilled by the flight data assistant.*
35	12	4.1	STRIP MANAGEMENT / GENERAL Kommentar Siehe Kommentar zu Punkt 34.
35	*12*	*4.1*	*STRIP MANAGEMENT / GENERAL* *Comment* *See comment on item 34.*
36	12	4.2	RECORDING OF INFORMATION Kommentar Ob der Flugverkehrsleiter die Kontrollstreifen der beiden Flüge korrekt markiet hat, kann vom Kommentator nicht beurteilt werden, da sie ihm nicht vorliegen.
36	*12*	*4.2*	*RECORDING OF INFORMATION* *Comment* *It says: "Record all relevant flight data on a flight progress strip, whenever such information is not available on an electronic data display. Record on flight progress strips only such data as are required for the efficient execution of your duties. Relevant data displayed on the radar need not be registered on the flight progress strip. When using surveillance radar, record only those flight details necessary to permit procedural control to be introduced in the event of radar failure. Update flight data entered on flight progress strips, when necessary. ....".*

It cannot be judged by this commentator whether the air traffic controller had properly marked the flight progress strips on both flights, since these strips are not available to him.

37 14 4 RULES APPLICABLE IN FOREIGN AIRSPACE
Kommentar
Da für den Zeitpunkt des Unfalls für den Flugverkehrsleiter der für das Radar-System von SKYGUIDE gültige Mindest-Staffelungwert von 7 NM anzuwenden war, bestand die Staffellungsunterschreitung bei Anwendung von Radarkontrolle im Gegensatz zu der ICAO Regel anstatt bei 5 NM bereits beim Unterschreiten des Wertes von 7 NM (1 Seemeile = 1852 m).

37 14 4 RULES APPLICABLE IN FOREIGN AIRSPACE
Comment
It says: "When providing ATS to aircraft in foreign airspace, in accordance with delegation agreements, apply the operational procedures published by the foreign state concerned. However, as radar separation minima are system dependent, skyguide ATM operators shall apply radar separation according to Swiss minima when providing radar services to aircraft in foreign airspace. ...".
Since a minimum separation value of 7 NM had to be applied with the radar system of skyguide by the air traffic controller at the time of the accident, the infringement of separation by application of radar control procedures contrary to the ICAO rule already existed when the value of 7 NM instead of 5 NM (1 nautical mile = 1852 m) had been infringed.

38 17 App. 2 1 + 1.1 PROCEDURES APPLICABLE IN FOREIGN AIRSPACE / REGULATIONS
Kommentar
Die für den deutschen an die Schweiz delegierten Luftraum in Deutschland geltenden relevanten Regeln des Flugverkehrskontrolldienstes unterscheiden sich nicht von den im ATMM niedergelegten schweizer Regeln.

38 17 App. 2 1 + 1.1 PROCEDURES APPLICABLE IN FOREIGN AIRSPACE / REGULATIONS
Comment
It says: "When providing ATS in an airspace within which the responsibility for the provision of ATS has been delegated by a foreign State to Switzerland, skyguide ATM operators shall apply the ATS regulations published by the competent foreign Authorities....".
The current relevant rules on the provision of the air traffic control service for the German portion of airspace delegated to Switzerland do not differ from the Swiss rules as contained in the ATMM.

Anmerkung

Dieser Kommentar wurde ausschließlich auf der Grundlage des am 1..7.2002 gültigen Inhalts des Schweizer Betriebshandbuches für die Flugverkehrsdienste "ATMM" erstellt. Der Kommentator hat keinerlei Information über evenuell bestehende zusätzliche lokale Dienstanweisungen der Flugverkehrs-Kontroll-Zentrale Zürich vorliegen.

Note
This commentary was produced solely on the basis of the then current contents of the Swiss air traffic management manual for the air traffic services on 1 July 2002. The commentator has no information available to him on eventually existing additional local directives of the Zürich air traffic control centre.

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24 Jan 2004

REFERENCES TO ICAO ANNEXES AND DOCUMENTS
on the
RESPONSIBILITY OF ATS PROVIDERS
for the
ESTABLISHMENT AND MAINTENANCE OF STANDARD SEPARATION BETWEEN CONTROLLED FLIGHTS

H Radio Telephony Transcript of Frequencies 128,050 and 119,920 MHz of Zürich ACC of 1 July 2002, as published on the internet by "aviation-safety.net"

Comment

This transcript has not been prepared correctly, since it does not allow to determine at which time messages have been transmitted, respectively received on the two used frequencies at each of the two working positions; see telefax commentary under "I".

Transcript of Original Tape Recording

Subject **Accident DHX611 / BTC2937 of July 2, 2002** (midair collision)

Call Signs

611 = DHX611 Dilmun (DHL International)
6497 = EXS6497 Express (Channel Express)
933 = THA933 Thai Inter (Thai Airways)
4575 = TAR4575 Tunair (Tunis Air)
286 = NMB286 Nambia (Namib Air)
305 = BVR305 Bavarian (Bavaria)
935 = EZS935 Topswiss (Easyjet Switzerland)
256 = CRX256 Swiss (Swiss AirLines)
7791 = LTU7791 LTU (LTU)
6073 = SRR6073 White Star (Star Air)
5621 = MON5621 Monarch (Monarch Airlines)
505 = PGT505 Sunturk (Pegasus)
1135 = AEF1135 Aero Lloyd (Aero Lloyd Flugreisen)
2937 = BTC2937 Bravo Tango Charlie (Bashkirian Airlines)
5177 = XLA5177 Expo (Excel Aviation Limited, UK)

S RE = Zurich South Sector Radar Executive
AR RE = Zurich Arfa Sector Radar Executive (also A RE)
TSRP = Telephone Zurich South Sector Radar Planner
TFHA = Telephone Friedrichshafen Tower

Frequency Zurich South Sector / S RE 128.050 MHz
Zurich Arfa Sector / AR RE 119.920 MHz

To	From	Time UTC	Communication
S RE	**611**	**21:20: 08**	**Zurich äh..Radar, ah.. good evening, DHX611, I'm climbing flight level 260, direct to*…..** ***unreadable**
T**?	TSRP	:09	go ahead?
TSRP	T**?	:10	du hast noch den Exjet noch, 6497
T**?	TSRP	:12	ja, er kommt rüber
TSRP	T**?	:13	ja, danke
611	**S RE**	**:16**	**say again, sorry**
6497	S RE	:19	EXS6497, contact rhine 120 93
S RE	6497	:24	Rhine 127 93, 6497, correction, 120 93
S RE	933	:31	control, THA933, good evening
933	S RE	:34	THA933, good evening, route Trasadingen – ALGOI
933	S RE	:43	THA933, did you copy?

**RHI, FRA oder MUN

S RE	933	:46	äh…copied THA933, please, say again
933	S RE	:48	proceed Trasadingen – ALGOI
S RE	933	:53	“transangen” to ALGOI, THA933
933	S RE	:56	Tango – Romeo – Alpha then ALGOI
S RE	933	:59	roger, Tango – Romeo – Alpha and then ALGOI
4575	S RE	:21:03	TAR4575, direct Trezzo
S RE	4575	:07	direct to Trezzo. 4575, thank you
286	S RE	:11	NMB286, proceed direct Genua
S RE	286	:14	direct Genova, NMB286
305	S RE	:16	BVR305, descend flight level 220
S RE	305	:20	descending flight level 220, BVR three o five
935	S RE	:24	EZS äh..935, äh.. proceed direct TORPA
S RE	935	:31	direct to Hochwald, EZS935, confirm?
935	S RE	:34	TORPA
S RE	935	:36	ah, to TORPA, 935, thank you
S RE	256	:39	CRX256, maintaining flight level 270
256	S RE	:41	thank you, for further contact Padua 120 decimal 72. bye bye
S RE	256	:46	20 72. bye-bye, thank you
S RE	**611**	**21:21:50**	**äh… Swiss Radar, good evening, DHX611, just levelling flight level 260, direct ABESI**
611	**S RE**	**:56**	**DHX611, squawk 7524**
S RE	**611**	**:59**	**7524, 611**
305	S RE	:22:06	and BVR305, Initially cleared level 270
S RE	305	:11	cleared level 270, BVR three o five
611	**S RE**	**:54**	**DHX611, Identified, climb flight level 320, direct TGO**
S RE	**611**	**:59**	**roger, climb flight level 320, direct TGO, and requesting 360, thanks if it’s available**

611	**S RE**	**:23:04**	**roger, expect äh… further climb in äh… four to five minutes**
S RE	**611**	**:06**	**611 thanks**
7791	S RE	:11	LTU7791, now direct Tango, descend level 120
S RE	7791	:20	direct Tango, level 120, confirm for LTU7791?
7791	S RE	:25	LTU7791, you're cleared flight level 120, and you may proceed direct Tango
S RE	7791	:31	thank you, direct to Tango, level 120, LTU7791
6073	S RE	:35	SRR6073, contact Rhine 120 decimal 930, good-bye
S RE	6073	:40	120 930, SRR6073
5621	S RE	:51	MON5621, after Hochwald direct Luxeuil
S RE	5621	:55	Hochwald – Luxeuil, MON5621
7791	S RE	:24:16	LTU7791, rate two thousand feet a minute or more now, until passing level 150
S RE	7791	:23	two thousand or more, until out of 150, LTU7791
TRHA	TSRP	:25:43 **	(dead phoneline) end :25:49 *** first try to reach EDNY
S RE	935	:52	and the EZS935 is reaching level 240, for higher
935	S RE	:56	thank you, Sir, contact Reims 134 4, good-bye
S RE	935	:59	134 4, EZS935, bye-bye
305	S RE	26:06	BVR305, descend level 220
S RE	305	:09	descending level 220, BVR three o five
305	S RE	21:26:12	right, what ist your rate of climb, äh rate of descend now?
S RE	305	:14	two tousand, BVR three o five
305	S RE	:17	roger, maintain two thousand or more, out of flight level äh… 250
S RE	305	:21	will maintain two thousand or more, out of 250, BVR three o five
286	S RE	:25	NMB286, climb flight level 350
S RE	286	:29	climb level 350, NMB286
611	**S RE**	**:36**	**DHX611, climb flight level 360**

S RE	**611**	**:39**	**climb flight level 360, DHX611**
4575	S RE	:44	TAR4575, contact Rome 132 decimal 9, bye-bye
S RE	4575	:49	132 decimal 9, TAR4575
505	S RE	:27:00	PGT505, contact Reims 133 decimal 830, bye-bye
S RE	505	:07	133 830, bye-bye, 505
286	S RE	:34	NMB286, contact Roma 132 decimal 9, bye-bye
S RE	286	:38	132 9, thanks, NMB286
7791	S RE	:28:04	LTU7791, contact Stuttgart 125 05, bye-bye
S RE	7791	:13	25 05, LTU7791, bye-bye
S RE	305	:56	BVR three o three*, äähm… approaching flight level 220 *says "three o three"
305	S RE	:29:01	BVR305, contact Frankfurt 127 05, bye-bye
S RE	305	:06	127 05, BVR three o three, five, bye-bye
TFHA	TSRP	:29:25	****…… ****second try to reach EDNY, first time via by pass-nr., it rings and….
TFHA	TSRP	:37	***** *****Tape: "tü-tü-tüüt, die gewünschte Verbindung ist nich möglich, bitte überprüfen Sie die Rufnummer" and the same once in French and….
TFHA	TSRP	:44	...."hel".... ******..... end :29:50 ******....once in Italian
AR RE	1135	21:30:07	"Zürich grüezi", äh… AEF äh…1135, descending flight level 80
S RE	**2937**	**:11**	**Zurich, good evening, BTC2937**
1135	A RE	:18	AEF1135, roger, äh… call you back
2937	**S RE**	**:26**	**station calling say again, please**
S RE	**2937**	**:28**	**äh, Zurich, good evening, BTC2937, level 360**
2379	**S RE**	**:33**	**BTC2937, squawk äh.. 7520**
AR RE		:34	and AEF äh..1135 is inbound the final approach fix for ILS runway 24
1135	A RE	:44	"ja" expect so, call you back shortly
933	S RE	31:15	THA933, contact now Munich 132 decimal 140, good-bye

S RE 933	:20	132 140, THA933, good-bye
5621 S RE	:26	MON5621, contact Reims 133 decimal 830, bye-bye
S RE 5621	:32	133 830, MON5621
AR RE 1135	:32:15	and AEF äh…1135, request lower
1135 A RE	:19	AEF1135, descend flight level 70
AR RE 1135	:23	descending flight level 70, AEF1135
1135 A RE	:28	correct, what is your present heading?
AR RE 1135	:30	present heading is 265
1135 A RE	:33	roger, right turn heading 280, vectors ILS 24
AR RE 1135	:37	right heading 280, for.. to expect ILS 24, AEF1135
TFHA TSRP	:50	*******……. ******third try to reach EDNY, second time via by pass-nr., handdialing, it rings and…
TFHA TSRP	:33:08	********……. ********Tape:"tü-tü-tüüt, die gewünschte Verbindung…" etc
TFHA TSRP	:11	"du das geht auch nicht" end :33:15
1135 A RE	:34:03	AEF1135?
AR RE 1135	:05	AEF1135, go ahead, Sir?
1135 A RE	21:34:08	"ja", I lost my phone connection to Friedrichshafen, äh…could you please call them on your second set äh... 124 decimal 35 and äh.. tell them you're coming ILS 24, with äh... twenty miles now?
AR RE 1135	:21	okay, will do
1135 A RE	:22	thank you
1135 A RE	:26	and AEF1135, descend five thousand five hundred
AR RE 1135	:30	descending five thousand five hundred, AEF1135
1135 A RE	:35	ONH is 1008
AR RE 1135	:38	1008, five thousand five hundred, AEF1135
2937 S RE	**:49**	**the BTC2937, äh descend flight level äh… 350, expedite, I have crossing traffic (end :34:57)**
2937 S RE	**:35:03**	**BTC2937, descend level 350, expedite descent**

(end :35:07)

S RE 2937	**:07**	**expedite descent level 350, BTC2937** **(end :35:12)**
AR RE 1135	:09	and "Zürich" from the AEF1135?
2937 S RE	**:13**	**"ja", we have traffic at your… 2 o'clock now at 360** **(end :35:17)**
S RE 611	**:19**	***……six hundred..äh TCAS-descent** ***unreadable, probably 35 canadian pilot on R/T, other pilot's voice coming through open mike**
AR RE 1135	:21	"Zürich" from the AEF1135?
1135 A RE	:25	"ja" go ahead?
AR RE 1135	:27	we have äh… positive contact with äh... Friedrichshafen äh… Radar
1135 A RE	:31	ah okay, turn left heading 240, interoept ILS 24, desvend four thousand feet
S RE 5177	:31	Zurich, XLA5177, maintaining flight level 360
	21:35:32	***Kollision beider Flugzeuge (Anmerkung der Redaktion)***
AR RE 1135	:37	left 240, cleared ILS 24, AEF äh…1135
	:37	**…… / / / / **morse on frequency ATTN = attention
	:44	***……. ***first windy noise
AR RE 1135	:45	can we go äh… Friedrichshafen?
	:47	***….. **** second loud windy noise
1135 A RE	:50	affirm, bye-bye
AR RE 1135	:51	bye-bye
2937 S RE	**21:36:01**	**BTC2937?**
2937 S RE	**:23**	**BTC2937?**
		-end-

there aren't any coordination calls between Friedrichshafen and Zurich, due to nonfonction of the phone connection

ANSA + AIRADIO
Frank W Fischer
24 Jan 2004

REFERENCES TO ICAO ANNEXES AND DOCUMENTS
on the
RESPONSIBILITY OF ATS PROVIDERS
for the
ESTABLISHMENT AND MAINTENANCE OF STANDARD SEPARATION BETWEEN CONTROLLED FLIGHTS

I ANSA Comment of 20 January 2004 on Attachment H to BFU Braunschweig and Berne

See content of the attached telefax message to BFU Braunschweig.

INTERNATIONAL ADVISORY GROUP AIR NAVIGATION SERVICES

The ANSA Group
FSB Air Traffic Control & Management Advisors GmbH, Germany
Alfa Civil Aviation Services - ACAS Turkey
AIRADIO Aeronautical Radio & ATC Advisors, Germany

TELEFAX MESSAGE

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VON / FROM: **Frank W Fischer, President + Regional Representative Europe**

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DATUM / DATE: 20.1.2004 SEITEN/PAGES: 2

AN / TO : **BFU**
Bundeststelle für Flugunfall-Untersuchungen
(Aircraft Accident Investigation Bureau)
Braunschweig

FAX NUMBER : **0531 - 3548 -246**

BETREFF / SUBJECT: **Flugzeug-Unfall 1.7.2002 Überlingen /Transcript of Original Tape Recording**
(Aircraft Accident of 1 July 2002 at Überlingen / Transcript of Original Tape Recording)
REFERENCE: Accident DHX 611 / BTC 2937 vom 1. 7. 2002 (mid-air collision)

MESSAGE

Dear Sirs,

we have down-loaded from the internet and printed out the tape recording transcript on the accident of DHX611 and BTC2937. It cannot be determined, who produced the transcript. But we assume that it stems from the BFU or from SKYGUIDE themselves.

It contains the radio telephony message traffic which the air traffic controller at Zürich ACC exchanged between the listed aircraft (flights) between 21:20.08 and 21:36:23 hours on two separate frequencies (128,050 and 119,920) at two different, separate working positions.

The form in which this transcript has been prepared lets us to comment as follows:

1.
The radio messages on the two frequencies, on 128,050 or on 119,920, are being reproduced without differentiation on which of the two frequencies they were actually transmitted. This, however, must be of considerable importance for the determination of the cause of the accident and its circumstances, since hereby one can determine at which working position the air traffic controller stayed at the time of the respective transmission; and when not. Therefore, the messages would have to be reproduced separately for each of the two frequencies.

2.
From the transcript of the radio messages, which must be produced verbatim, complete and without modification, it cannot be concluded, how the air traffic controller and the pilots have actually expressed themselves as regards call signs, altitudes, courses, etc.

Example Time 21:20:08
Message exchange with DHX 611
Zurich äh Radar, ah.. good evening, DHX611, I´m climbing flight level 260, direct to*..... (unreadable)

Comment Did the pilot say **DELTA HOTEL XRAY SIX ONE ONE** or **DELTA HOTEL XRAY SIX HUNDRED ELEVEN** or **DILMUN SIX ONE ONE** ? If he had said DELTA HOTEL XRAY, then this must be shown exactly like that, and likewise D H X or DILMUN. The same applies to all transmissions from and to BTC 2937. Was BRAVO TAGO CHARLIE said or B T C or BASHKIRIAN ?

Comment Did he say **flight level two six zero** or **two hundred sixty** ? Also numbers should be reproduced exactly as they were spoken.

Apart herefrom it is strange that BTC2937 at 21:30:22 was assigned a new SSR code (7520), but not "identified" thereafter. According to the transcript corresponding information was not given to the pilot. As regards the transcript, it remains unclear, whether BTC2937 was identified with the new code or not.

This omission is of importance for the assessment of the resulting consequences since it is not evident whether the air traffic controller intended to or did apply radar separation, or only procedural (non-radar) separation, because he stayed or could stay at the working position for the upper airspace only a short while and was therefore unable to maintain the identification of BTC2937 as would have been required under radar control.

In our opinion he would have been able to apply vertical sepration between DHX611 and BTC2937 without any problem, which would have avoided the collision.

As already mentioned earlier we are making this commentary in the interest of avoidance of future accidents with the same cause and similar background.

Yours sincerely,

s./t. Frank W Fischer

ANSA

ANSA + AIRADIO
Frank W Fischer
24 Jan 2004

REFERENCES TO ICAO ANNEXES AND DOCUMENTS
on the
RESPONSIBILITY OF ATS PROVIDERS
for the
ESTABLISHMENT AND MAINTENANCE OF STANDARD SEPARATION BETWEEN CONTROLLED FLIGHTS

J EUROCONTROL PRESS RELEASE of 2 July 2002 and ANSA Comment of 20 January 2004 on the EUROCONTROL Press Release of 2 JUly 2002

Comment

See attached comment to EUROCONTROL. The respective footnote of the EUROCONTROL press release reads as follows:

"ACAS provides resolution advice to the pilot for collision avoidance, acting as a last resort method for preventing mid-air collisions. When ACAS evaluates another aircraft as a threat, a traffic alert is issued to the pilot. This tells the pilot that he may be required to manoeuvre the aircraft, instructing him to either climb or descend. The pilot must obey this instruction."

INTERNATIONAL ADVISORY GROUP AIR NAVIGATION SERVICES

EUROCONTROL
Directorate of the General Secretariat
External and Public Relations
Rue de la Fusée, 96
B 1130 Brussels

Bätterkinden, 20 January 2004

Subject EUROCONTROL Press Release of 2 July 2002
"Midair Collision over Germany"
A Comment for Correction

Dear Sir,

regarding the "Überlingen" mid-air collision too many wrong, misleading or incomplete statements have been published in the media, all of them too "willingly" allowing the public opinion and unknowledgeable people to blame the pilots for being the cause of the accident, and in doing so concentrating too much on the role of TCAS.

In this context we have just been reading your a.m. press release again and must point out that the last statement made on ACAS also contains wrong and therefore misleading information. In the interest of correct reporting we are sending you this late, but nevertheless important comment.

As the term "RA - Resolution Advisory" implies, pilots are given an advice on how to resolve the indicated conflict. They are not being instructed. The term RA had been introduced in the respective ICAO procedures to match with the internationally agreed ACAS procedures as published under para. 3.1.2 in ICAO document 8168 (PANS/OPS), leaving it up to the pilot to take the last decision, if to follow the RA or to take another deconflicting course of action. The corresponding and matching procedure as regards the air traffic controller´s reaction is contained in ICAO document 4444 (PANS/ATM) under para 15.6.3.1.

Furthermore, air traffic regulations in the Russian Federation, in force at the time of the accident, forced pilots to give preference to instructions for evasive manoeuvres by ATC before following a TCAS - RA.

It is therefore unfortunate that the public is being mislead by such disseminated information, which often leads to prejudice and premature decision on who was guilty. The ICAO procedure explicitly excluded the obligation of pilots to obey a TCAS - RA: Also Eurocontrol´s ACAS training brochure as well as the Swiss and German AIPs only state that pilots "should" follow an RA, but not "shall", i.e. under all circumstances. Any deviating national regulation would have had to be made known to ICAO anyhow under Article 38 of the ICAO Convention and to be published in the national AIP. This still does not change a pilot´s obligation to follow the rules of his aircraft´s state of registry, especially if it matches with the ICAO standards and recommended practices.

Sincerely yours,

Frank W Fischer
President

ANSA
President & European Representative
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ANSA + AIRADIO
Frank W Fischer
24 Jan 2004

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K IFATCA Report of October 2002 on the Überlingen Accident as published in THE CONTROLLER, Vol. 41, No. 3, Title "Zürich Disaster"

Without Comment

NOT ATTACHED

ANSA + AIRADIO
Frank W Fischer
24 Jan 2004

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L ANSA Questions of 17 June 2003 to BFU (AAIB) Braunschweig on the circumstances of the accident of 1 July 2002

See attached telefax message to BFU Braunschweig

INTERNATIONAL ADVISORY GROUP AIR NAVIGATION SERVICES

TELEFAX MESSAGE

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VON / FROM: **Frank W Fischer, President + Regional Representative Europe**

E-MAIL: **Europe Office: FischerAnsa @ aol . com**
Main Office: bruethy @ gmx.ch

DATUM / DATE: 17. 6. 2003 SEITEN/PAGES: 8

AN / TO : 1.
Bundesstelle für Flugunfalluntersuchung
(Federal Aircraft Accident Investigation Buerau)
Braunschweig, Deutschland

2.
Bundesstelle für Flugunfalluntersuchung
Bern, Schweiz

FAX NUMBER : 1. 0049 - 531 - 3548 - 246
2. 031 - 810 - 4150

BETREFF / SUBJECT: **Flugunfall "Überlingen" vom 1.7.2002 zwischen den Flügen BTC-2937 und DHX-611**
(Aircraft Accident "Überlingen" of 1 July 2002 between Flights BTC2937 and DHX611)

REFERENCE: Die Zwischenberichte von bfu.ch und bfu.de
(Interim Reports of bfu.ch and bfu.de)

Message

Dear Sirs,

as experts in the field of air traffic control and being familiar with the investigation of the causes of aircraft accidents on behalf of air traffic control, we, respectively our associations ANSA (International Advisory Group Air Navigation Services of Switzerland) and AIRADIO (Aeronautical Radio & Air Traffic Control Advisors of Germany) take the liberty to submit the following questions in connection with the aircraft collision at Überlingen (Lake Constance) on 1 July 2002 and in support of the investigation of the causes:

1.
How many air traffic control sectors have been operated at the air traffic control centre Zürich at the time before and during the accident ?

2.
Which working positions does each of these sectors comprise (e.g. lower airspace of Zürich FIR, respectively upper airsapce) ?

3.
Which of these working positions are to be manned during daytime in accordance with local directives, and which during night time ?

4.
Which working positions had actually been manned at the time of the accident and who were the air traffic controllers who had to man them continuously ?

5.
Who acted as watch supervisor at the time of the accident and assigned the air traffic controllers of the night shift on these working positions ?

6.
In case that no watch supervisor was on duty, who decided on the manning of the working positions to be operated ?

7.
Have the air traffic controllers of the night shift been properly licensed and rated (working position ratings) in accordance with the existing rules for work at these positions, such as for instance for area control in the lower airsapace, or similarly for the upper airspace or both sectors simultaneously ?

8.
Have the same air traffic controllers been medically fit in accordance with the standards of ICAO and Swiss provisions ?

9.
Had the air traffic controller responsible for both flights at any time before undergone training on the handling of unusual situations in the conduct of flights and air traffic control ?

10.
Does SKYGUIDE maintain such a program ?

11.
Taking into account the published fact that only two airspace sector working positions have been operated at the time of the accident, the question arises how far (how many meters) these two working positions were physically apart from each other, so that the traffic situation presentations of both working positions could have been simultaneously monitored and that incoming telephone calls could have been answered simultaneously.

12.
Taking into account the additional published fact that only one air traffic controller was present in the operations room of the centre at the time of the accident, the question arises which of the two working positions this air traffic controller occupied during the time of the receipt of the estimated entry times (boundary crossing estimates) of the two flights until the time of the collision.

13.
Who was entered in the logs of the concerned working positions as responsible air traffic controller and are the respective working position duty logs available to the BFU ?

14.
Did the air traffic controller continuously switch from one working position to the other and how long did he stay there at any given time ?

15.
At which time were the boundary crossing estimates (crossing of the boundaries of Zürich´s airspace area of jurisdiction) received at Zürich ACC and when were the respective flight progress strips (on the two flights) placed in front of, respectively presented to the controller ?

16.

Who had received the corresponding messages from Milano and Munich and processed them ?

17.
Had these flight progress strips been marked by the air traffic controller or a flight data assistant as regards the developing conflict situation ?

18.
Why did the responsible air traffic controller not assign another conflict free level to the TU154 or the B757 in time ? He must have detected the developing conflict already at the time when both flight progress strips had been put in front of him.

19.
At which time were all flight data by means of the flight progress strips available at the working position for the upper airspace (within the time period of 15 to 10 minutes before the collision) so that the air traffic controller was put in a position to detect the conflict ?

20.
Did the air traffic controller detect the developing conflict at all, and if yes, when ?

21.
Did the air traffic controller also give a collision warning to the B757 and, if not, why not ?

22.
Why didn´t the air traffic controller consider, on the basis of his own statement, another manoeuvre, such as a lateral deviation away from the collision course ?

23.
Did the responsible air traffic controller properly identify both flights with secondary radar for the application of radar control procedures and radar separation minima and, if yes, at which point in time ?

24.
Which provisions contains the Swiss operations manual for the air traffic control service (Swiss air traffic management manual) in respect of the keeping of working position assignment logs and the minimum manning of ACC sector working positions during day and at night ?

25.
For how long did the air traffic controller not occupy the working position for the upper airspace before the time of collision ?

26.
Did the air traffic controller at any time before beginning the night shift protest to become responsible for two physically separated (i.e. not simultaneously to be monitored) working positions alone ? If so, has this protest been entered into the daily log of the centre ?

27.
Did the air traffic controller realize that he would not have been allowed to leave his working position (upper airspace) at all in case of applying radar control procedures, and before he had established procedural (in this case vertical) separation, since he may exercise radar control only, when he continuously monitors the flights under radar control, separated by radar minima, on the radar screen.

28.
Where did the air traffic controller stay at the time when the German air traffic controller at the Karlsruhe centre (Rhein Control / Radar) tried to reach him on the direct line between the sectors concerned ?

29.
Which are the Swiss regulations on the maximum duration of an uninterrupted manning of working positions in the air traffic control service ?

We take the liberty to remark that the answers to these questions will have considerable weight in the clarification of who is to blame for the accident. For the same reason we are attaching our commentary on

the internationally current air traffic control procedures and on the compliance with the TCAS collision warning system procedures, which we already made last year.

Another desirable consequence for the future would be the mandatory equipage of all civil airplanes with a so-called radio override function, allowing all airplanes to receive any transmission of messages on the international VHF emergency frequency 121.5 MHz, whether disseminated by a ground or an aircraft station.

This feature, which we already recommended unsuccessfully in 1968, could have avoided also this collision with a warning to both airplanes on 121.5 MHz by the air traffic controller in the Karlsruhe centre.

Because in the interest of an enhancement of flight safety one cannot accept why all military UHF radios are fitted with this override function on UHF emergency frequency 243.0 MHz, whereas this has not been prescribed for civil airplanes until now and is therefore not done.

Yours sincerely,

s. / t. Frank W Fischer
President ANSA + AIRADIO

ANSA

ANSA + AIRADIO
Frank W Fischer
24 Jan 2004

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on the
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ESTABLISHMENT AND MAINTENANCE OF STANDARD SEPARATION BETWEEN CONTROLLED FLIGHTS

M ANSA Comment of 10 July 2002

See attached open letter to BFU Braunschweig and the press (dpa).

INTERNATIONAL ADVISORY GROUP AIR NAVIGATION SERVICES

Open Letter

Subject
Collision between a B-757 and a TU-154 on 1 July 2002

COMMENTARY ON THE CASE

According to the standards of the International Civil Aviation Organization (ICAO) in controlled airspace the full responsibility for the separation of flights in accordance with the instrument flight rules (in this case obligatory) solely rests with the air traffic control service whether provided with or without radar. Switzerland and Germany are ICAO member states.

Therefore, air traffic controllers are obliged to establish and maintain ICAO separation minima between flights under their control in an assigned airspace sector and to comply with the respective operations procedures, no matter if radio contact exists with an aircraft or not. Fulfilment of this task is made possible by aircrews submitting to air traffic control a flight plan before flight containing all required details on the intended flight.

This flight plan is being extracted in flight plan processing systems mostly by automated data processing for the purposes of air traffic control. As a result, normally flight progress strips are printed well ahead in time (ca. 20 to 30 minutes) of the actual flight, which contain all necessary data about the flight for the air traffic controller. The "control strips" are normally produced by ADP machinery for all important waypoints along the route of flight. Besides information on the call sign, aircraft type, speed, aerodromes of departure and destination and route of flight, they always contain the cleared flight level and the calculated time of entry into the respective control area (airspace sector).

Already with this information at hand the air traffic controller must plan for separation between this and other known flights, well in advance before direct radio contact is being established. The exhange of changes hereto is normally achieved by telephone from ATC centre to ATC centre, if necessary all around the globe.

Should radar not be available, then conventional (= procedural, non-radar) separation must be established, also when radio contact can not be established. Should already a conflict be detected for the time of entry into one´s own airspace sector, which cannot be resolved in time, then the transfer of the flight must be rejected or, alternatively, a conflict free transfer into the own sector be negotiated with the adjacent sector or neighbouring centre. Vertical separation of about 300 m is to be applied up to flight level 410 and about 600 m above.

Has radio contact been established and is radar available, radar separation may be applied on flights at the same level. In case of radar control the minimum separation en-route normally reduces to about 8 km (5 nm). This minimum separa-tion may not be infringed.

With flights at the same level, generalized, the minimum separation without radar between two flights is 10 minutes flying time, respectively 5 minutes with a difference in speed of 20 knots or 20/10 nm, provided distance measuring stations (DME) are available on the ground.

According to the facts meanwhile known, the cause of the collision therefore rests in the fact that the air traffic controller only began to solve the already existing conflict when the minimum separation (in this case 7 nm) had already decreased by half.

The separation of flights, which are to be conducted under air traffic control, must be ensured by the air traffic control service; it is wrong that air traffic controllers may normally wait until about one minute before an expected point of collision (SKYGUIDE statement), before they begin to resolve such a conflict. This would be a hazardous game.

STCA (short term conflict alert) as a ground-based secondary radar system function serves, if at all available, the air traffic controller as a last minute warning. In no case does it replace any of his superior obligations on the establishment

and maintenance of minimum separation. That the TCAS collision warning systems in both aircraft could not have been used by the pilots as a last means of survival does not change anything on the commented situation and its legal consequence; it may therefore not be used as an argument for the cause of the collision to the wrong side on who was guilty, namely to the innocent pilots.

It is not the role of TCAS to replace the duty of air traffic control to establish separation. TCAS as an autonomous on-board warning device on the basis of SSR transponders only serves the purpose to avoid collisions between aircraft by obeyance of the collision warnings, when air traffic control has failed to fulfil its duties. Not all airplanes, which have to operate under air traffic control, must be equipped with TCAS. The corresponding international rules and procedures are laid down unambigiously in ICAO documents 4444 PANS-ATM and 8168 PANS-OPS.

All other used arguments and additional aspects do not change anything on this responsibility of the air traffic control service. They only constitute subordinate factors, which do not change the real cause. In this case, therefore, the full and only responsibility rests with air traffic control.

Frank W Fischer
President
International Advisory Group Air Navigation Services
Air Traffic Control Expert
CH 3312 Fraubrunnen, Switzerland

10 July 2002

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ANSA