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STUDIES ON THE FLIGHT MEDICAL ASPECTS OF THE GERMAN LUFTHANSA NON-STOP ROUTE FROM FRANKFURT TO RIO DE JANEIRO PART 1

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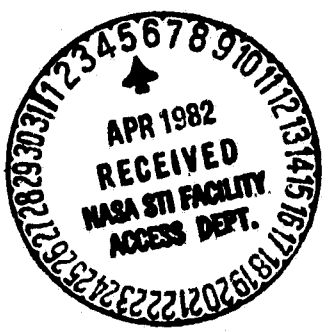

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16. Abstract

The problem of crew size for regularly scheduled German Lufthansa flights between Frankfurt and Rio de Janeiro is discussed. Factors affecting crew performance are examined, comparisons are drawn to regulations of other countries and crew questionnaires and tests are presented.

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Preface

The present report documents the planning and the first stage of studies carried out by the DFLVR Institute for Flight Medicine for the Federal Ministry of Transportation. The text is essentially identical to that in the intermediate report sent on July 21, 1981, to section L 17 in the Federal Ministry of Transportation. The additions were, above all, the documentation of questionnaires, developed or compiled for this project.

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STUDIES ON THE FLIGHT MEDICAL ASPECTS OF THE GERMAN LUFTHANSA NON-STOP ROUTE FROM FRANKFURT TO RIO DE JANEIRO

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1. Introduction /1*

Since April 1980 the German Lufthansa has conducted non-stop flights with a B 747 between Frankfurt and Rio de Janeiro. Since the working time for the flight exceeds the permissible limits, a request was submitted for an exception to this limit. Temporary permission was given under the condition that the initial flight FRA-RIO be conducted with a back-up crew, while the return flight could be carried out with a normal single crew. This situation is considered unsatisfactory.

2. Problem

The scheduled flight time (block time) on the non-stop route FRA-RIO amounts to 11 hours and 45 minutes for the initial flight and 11 hours and ten minutes for the return flight. The flights in both directions are at night. The crew must come to work 90 minutes before scheduled departure in Frankfurt and 60 minutes beforehand in Rio de Janeiro. The working time for the flights is then:

FRA-RIO 11 Hours and 45 Minutes + 90 Minutes + 15 Minutes =
13 Hours and 30 Minutes

RIO-FRA 11 Hours and 10 Minutes + 60 Minutes + 15 Minutes =
12 Hours and 25 Minutes.

According to the second German Working Ordinance for Air Transportation, the limit of permissible working time for a normal crew is

*Numbers in the margin indicate pagination in the foreign text.

12 hours, since more than four hours of the working flight time are at night (para. 8, sections 1 and 2). Therefore a single crew is not permissible on the initial or the return flight. Both flights would be possible with a back-up crew in accordance with para. 8, section 4, since a double extension up to 18 hours can be permitted within seven subsequent days. Details of the concept of a "back-up" are not defined in para. 8, section 4. The flights are therefore conducted on the basis of an exception in accordance with para. 12 of the working ordinance for air traffic. This permission was granted under the condition that the initial flight FRA-RIO be carried out with additions to the crew of one flight officer and one flight engineer. According to the exception in para. 12, the maximum permissible working flight time for both directions amounts to 14 hours in spite of the fact that a maximum of 18 hours would be permitted according to para. 8, section 4, with a back-up for the flight personnel. In the case of a delay of more than 30 minutes in departure from Frankfurt, for example, this can lead to the necessity of replacing the normal crew with the standby crew. /2

Previous experience of the German Lufthansa with the non-stop flights FRA-RIO and RIO-FRA have been favorably evaluated with respect to regularity and punctuality in flight operations for several months and with respect to acceptance of the assignment regulation for the crews (see the Lufthansa Report on the RIO express route from April 5 go November 9, 1980). Nothing unusual was noted in comparison to regular operations.

This positive experience has led the German Lufthansa to consider also submitting a request for an exception on the FRA-RIO route according to para. 12 of the second German Working Ordinance for Air Traffic, entirely unrelated to considerations of para. 8, section 4 (back-up for the crew), as is already permitted for the flights RIO-FRA in the form of a single crew. An agreement was made between the German Lufthansa and government officials, however, to conduct a study on the flight medical aspects for information purposes. The Federal Ministry for Transportation then approached the DFVLR Institute for Flight Medicine with the request to accept

this task on the basis of the extensive information available to the institute (letter of the Federal Ministry for Transportation on Dec. 23, 1980, L 17/60.01.60.02 (C) and on Jan. 28, 1981, L 15/14.46.11 (L-93/V)).

A study plan was prepared by the Institute for Flight Medicine (see section 3), then discussed and agreed upon in a conference with the German Lufthansa, department FRA DN on Jan. 30, 1981. It was decided to carry out phases 1 through 3 and then to apply the results to a decision on whether to conduct the further phases of the study.

3. Study Plan /3

The plan was intended to provide first only a skeleton for the activities considered necessary. More detailed information was to be prepared when necessary in the course of the study, e.g. with respect to schedules, methods, type and extent of the cooperation. For practical reasons the planned activities were divided into phases, grouped according to aspects of time and content.

Therefore the order of the phases is also the sequence of the planned partial tasks in time. Furthermore, the possibility was foreseen, that the study might be interrupted or concluded early (see phase 3), if this become necessary on the basis of the information gained.

Planned Activities

PHASE 1

- Literature research
- Evaluation of the Rio flights with the aid of models from literature
- Comparison with Regulations of other countries
- Draft of special questionnaires

PHASE 2

- Observation and interviews carried out by medical flight personnel during flights

- Evaluation of the flights and the assignment regulation according to standard values
- Interviews by means of questionnaires (sleep log and general questionnaire)

PHASE 3

- Evaluation of phase 2
- Evaluation and discussion of results
- Decision on continuation of the study

The following phases will only be carried out if the decision in phase 3 and a subsequent feasibility analysis are positive. /4

PHASE 4

- Preparatory work
- Gathering objective data through measurements of the crew
  Planned psychophysiological parameters:
  - ecg (continuous recording)
  - eeg (continuous recording during waking and sleeping periods)
  - urine samples (for determining 17 OHCS and catecholamines)
  - sleep log (behavior while asleep)
  - paper-pencil tests (fatigue, performance)
- Measurements during the circuit and, if possible, in a simulator
- Comparison of a single crew with a reinforced crew (assuming that a single crew is also employed)

PHASE 5

- Evaluation of the data from phase 4
- Summary of the results

4. Results of Phase 1

The assignment plan of the German Lufthansa includes 4 different crew circuits, both for the single crew and for the back-up crew (see

appendix A1). The circuits of both types of crew differ mainly in only an initial and return flight FRA-RIO for the crew back-up, while an additional circuit in South America lasting several days is carried out by the main crew between the two flights. The following circuits were selected as representative for the subsequent calculations and comparisons: first and second circuit of the crew back-up, as well as circuit 4 of the single crew. Both circuits of the crew back-up differ in departure time of the return flight RIO-FRA (0040 or 1940 local time), circuit 2 also has the shortest time between flights in RIO (shorter recovery period). Circuit 4 is considered especially stressful for the situation of the main crew, since the return flight RIO-FRA is carried out very quickly (ca. 20 hours) after conclusion of a long assignment (ca. 12 hours) on the South American route. /5

In the following, first the results of the model calculations are described and then the comparisons are drawn to regulations of other countries.

4.1 Models

The degree of stress of the flights or circuits were evaluated (appendix A3) using the models of Gerathewohl, Mohler and Nicholson [1,3,4]. Aided by formulas or tables, these models permit the formation of a numerical picture of those factors contributing to stress: duration of flight service, departure and arrival times, night flight, shifts in time, duration of the circuit and the time between flights, accumulated flight service time, etc. The models differ in approach and in consideration of the number of factors and their weights. The model of Gerathewohl was originally developed for the business passenger and later expanded by us [2] to the conditions of the flight crew. Mohler's model probably achieves a more realistic evaluation according to our experience and from the approach he took. Nicholson's model takes only the accumulated flight service time into consideration in relation to the time spent during a circuit or an assignment. We feel that the consequence is a much too broad and hardly differentiated evaluation. Details of

methods, application and comparison of various procedures are described in [2]. The degree of stress is indicated in three stages: "normal", "great", "especially severe".

In evaluating the degree of stress of the individual flights FRA-RIO and RIO-FRA, the calculations lead to differing results. All flights of the models of Gerathewohl and Mohler are assessed as "especially severe" (exception is the return flight with the earlier departure time, classified according to Mohler only as "great"). According to Nicholson there are no degrees of stress deviating from "normal" for all conditions. /6

The recovery times between the individual flights are an important factor in evaluating the circuits, so that, for example, two especially stressful assignments may receive a circuit assessment in a lower category when the break between flights is of appropriate length. This applies in Mohler's calculations for all three circuits considered here, with a lower assessment in the total index than expected according to the simple average of the individual flight legs. Accordingly, the two circuits 1 and 2 of the crew back-up are evaluated as "great", but circuit 4 of the single crew as "normal". Nicholson's model also produces no degree of stress deviating from "normal" for all three circuits when evaluating the individual flights.

4.2 Regulations of Other Countries

Regulations from 5 countries were used for comparison: England, Scandinavia, USA, USSR and Switzerland (see appendix A6). According to these regulations, the non-stop flights FRA-RIO and RIO-FRA can not be conducted with a single normal crew (1 CP, 1 FO, 1 FE) with two exceptions. The exceptions are the rules of the CAA and the FAA. The CAA permits only the return flights of circuits 2 and 3 of the single crew with a normal crew, but the return flights of the circuits 1 and 4 are not permissible, since a maximum flight service time of only 12 hours is permitted, as in our case. The

presently applicable regulation of the FAA permits the flights in both directions with a single crew with no limitations. Even in this case, however, the pure flight times of 11 hours and 45 minutes or 11 hours and 10 minutes are close to the maximum time limit of 12 hours. In addition, the maximum flight time is to be reduced to 10 hours in the proposed revised regulations [6]. Then both flights with a single crew would no longer be possible. /7

All regulations are identical with respect to a back-up crew: under these circumstances all flights are permissible with no exceptions.

5 Results of Phase 2

The planned observations of phase 1 were carried out on two subsequent South American circuits from March 7 to 15 and March 21 to 29 in 1981 (time given is local time):

1.) Circuit 4 of the single crew

Day of Departure					Day of Arrival
SAT	508	FRA 2200-0545 GIG			SUN
WED	500	GIG 0705-0810 VCP	0910-1140 EZE		WED
FRI	502	EZE 1240-1440 SCL			FRI
FRI	503	SCL 1610-1755 EZE	1855-2120 VCP		
			2220-2320 GIG		FRI
SAT	507	GIG 1940-1050 FRA			SUN

2.) Circuit 4 of the crew back-up

Day of Departure			Day of Arrival
SAT	508	FRA 2200-0545 GIG	SUN
WED	501	GIG 1940-1050 FRA	THUR

Two flight medical researchers accompanied the flight crews on these circuits with both initial flights FRA-RIO being simultaneous, but one researcher accompanied the back-up crew on the

return flight and the other the single crew on the longer circuit. The aim of accompanying the crews was to gather information on the degree of stress through conversations and observation (including studying oneself). The attempt was to be made especially to clarify whether the solution of the crew back-up with one flight officer and one flight engineer contributes substantially to the reduction of stress and, on the other hand, whether this may be superfluous or not utilized in a sensible manner. The total crew included 5 CP, 8 FO and 8 FE. /8

The results for the cockpit crew may be summarized as follows:

1. Considering the factors of duration of flight, night flight, shift in time, time of departure and arrival, duration of rest time between flights, only the first two contribute substantially to stress.

2. During the flights the impression was formed that the stress of the non-stop route FRA-RIO is considerable in both directions (degree of stress "great" to "specially severe"). The majority of crew members classified the stress on the return flight as lower than on the initial flight.

3. The back-up has little influence on the circuit portion in South America. Each individual had a different opinion on this influence. It probably has an effect on the circuit 4 in the study, since in this case the return flight RIO-FRA follows almost immediately after a relatively long assignment.

4. The crew back-up including one flight officer and one flight engineer is judged sufficient in general. The possibility to sleep is also used by the captains (3 hours or more around the middle of the flight). Some captains state that they do not sleep during the flight, because they believe the responsibility they have does not permit them to sleep (an official statement on delegating responsibility might possibly help this situation). On the other hand, some captains did not

need to be relieved of their duties, because they felt that the work load was tolerable. One crew member was also interviewed who thought that a single crew is sufficient. /9

5. The crew back-up in the present form is a good approach to the problem of reducing stress and is also apparently applied sensibly to the practical situations.

6. The crew bunk is considered satisfactory. Only a few crew members indicated that they had difficulty falling asleep. It was also emphasized in these cases, however, that lying down and relaxing contributed to recovery.

7. The duration of the time between flights on all the circuits we observed was enough to permit sufficient or very good periods of rest. This probably also applies to the other circuits, since the assignment plans to not include any substantially shorter times between flights.

These statements apply only to the cockpit crew. The conditions for the staff in the cabin differ; however, these will not be examined here, since the original task concerned only the cockpit crew. The observations in connection with the cabin crew will therefore be presented only briefly in appendix (A2).

6. Summary /10

According to aspects of flight medicine the flights on the non-stop route FRA-RIO must be assessed as "great stress" to "very stressful", while the initial flight FRA-RIO belongs more in the category "very stressful" and the flight RIO-FRA more in the category "very stressful". Factors contributing substantially to the stress are 1) the long flight service time and 2) the fact that both the initial and the return flight are at night. The portions of the circuit in South America have only a small effect on stress, if at all, and only in individual cases.

The regulations with flight crew back-up of one flight officer and one flight engineer, as well as with two separate crew bunks, presently in effect for the German Lufthansa, is a good solution. This conclusion can be drawn both on the basis of medical considerations and on the basis of the analysis of models and comparison with the regulations of other countries. However, it applies only under the condition that the possibility for relieving the crew members is utilized sensibly, i.e. that sufficient breaks are taken during the flight. On this point, the question of delegating responsibility by the captain must still be clarified. There are no objections from the flight medical viewpoint for permitting flights in accordance with para. 8 section 4 of the second German Working Ordinance for Air Traffic, given the back-up of the single crew of one flight officer and one flight engineer.

The non-stop flights FRA-RIO cannot be carried out with a single crew according to most regulations and models. The flights with working times up to 13.5 hours also lie at the boundary limit according to medical considerations. The question about whether the single crew could be employed without reducing flight safety could not be answered.

Flights with similar conditions have generally been evaluated on the basis of observations and self-rating procedures up to now. The also applies to the models discussed above. Objective medical measurements have only been carried out in individual cases. We therefore consider it necessary to continue the study. Then other flights of similar difficulty could also be employed for comparison. /11

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1 captain, 1 flight officer, 1 flight engineer (single crew) /A1

All times in GMT

Day of Departure			Day of Arrival
1. [a] Umlauf:			
2	500	FRA 2100=0845 GIG	3
5	502	GIG 1005-1110 VCP 1210-1440 EZE DH503 2155-0020 VCP	6
6	507	VCP 2025-2125 GIG	6
7	509	GIG 2240-0950 FRA	1
2. [a] Umlauf:			
4	502	FRA 2100-0845 GIG	5
6	506	GIG 1005-1110 VCP 1210-1430 MVD DH507 1715-1925 VCP	6
7	509	VCP 2025-2125 GIG	7
3	501	GIG 2240-0950 FRA	4
3. [a] Umlauf:			
5	506	FRA 2100-0845 GIG	6
7	508	GIG 1005-1110 VCP 1210-1440 EZE DH509 1700-1925 VCP	7
3	500	VCP 1210-1440 EZE DH501 1700-1925 VCP 2025-2125 GIG	3
6	503	GIG 0340-1450 FRA	6
4. [a] Umlauf:			
6	508	FRA 2100-0845 GIG	7
3	500	GIG 1005-1110 VCP 1210-1440 EZE	3
5	502	EZE 1540-1740 SCL DH503	
		SCL 1910-2055 EZE 2155-0020 VCP 0120-0220 GIG	5
6	507	GIG 2240-0950 FRA	7

1 Fo 1 Fe [b] (crew-Verstärkung)

1. [a] Umlauf:			
2	500	FRA 2100-0845 GIG	3
6	503	GIG 0340-1450 FRA	6
2. [a] Umlauf:			
4	502	FRA 2100-0845 GIG	5
6	507	GIG 2240-0950 FRA	7
3. [a] Umlauf:			
5	506	FRA 2100-0845 GIG	6
7	509	GIG 2240-0950 FRA	1
4. [a] Umlauf:			
6	508	FRA 2100-0845 GIG	7
3	501	GIG 2240-0950 FRA	4

Key: a. circuit b. back-up

The Situation of the Cabin Crew /A2

The conditions for the cabin crew, insofar as they were examined by us, are substantially different. This applies especially to the back-up (not required in any case according to the legal regulations) and the evaluation of possibilities for sleep and rest in the aircraft.

Due to the unfavorable position (near the pantry and the rest rooms) the separate bunks are subject to considerable disturbance. The seats for resting are of limited use for sleeping, at least on the observed circuits, since the back of the seat cannot be tipped back. At the times when most work must be done (dinner at the beginning of the flight and breakfast at the end), the large number of people working at the same time may get in each other's way rather than help. Finally, there are too many crew members between the times of most work for the limited number of places for rest and sleep, so the greater number due to a crew back-up would certainly lead to a reduction in rest time for each individual. For these reasons, a crew back-up is also partially rejected by members of the cabin crew.

In summary, we are of the opinion that the regulation applied at the present for the cabin crew needs reworking. Both the quality of bunks for sleeping and the extent of a back-up should be included in the considerations.

Determination of the Degree of Stress with the Aid of Models /A3

3 Models: Gerathewohl, Mohler, Nicholson [1,3,4]

Evaluation according to 2 in three stages:

+ "normal"

++ "great"

+++ "especially stressful"

The formula according to Gerathewohl permits only the application on the individual flight leg, while the models of Mohler and

Nicholson may also be applied to circuits. Therefore, first the calculations for the individual flights FRA-RIO and RIO-FRA (the latter with 2 different departure times) will be carried out. Then the assessment of the circuits 1 and 2 of the crew back-up and of the fourth circuit of the single crew follow only based on the models of Mohler and Nicholson.

1. Flight FRA 2200 - 0545 GIG

- According to Gerathewohl

$$R = T + N_t + C_D + C_A + G_C + A_C$$

$$= 13.5 + 2 + 4 + 4 + 1 + 2 \quad = 26.5^{+++}$$

- According to Mohler

$$\text{Index} = 1.1 \times 1.0 \times 1.7 \times 1.4 \times 1.1 = 2.86^{+++}$$

- According to Nicholson

13.5 hours flight working time in 24 hours^{+}

2. Flights GIG-FRA

a) GIG 0040 - 1550 FRA

b) GIG 1940 - 1050 FRA

- According to Gerathewohl

a) $R = 12.4 + 2 + 4 + 3 + 2 + 2 = 25.4^{+++}$

b) $R = 12.4 + 2 + 3 + 5 + 2 + 2 = 26.4^{+++}$

- According to Mohler /A4

a) $\text{Index} = 1.1 \times 1.3 \times 1.7 \times 1.5 \times 1.2 = 4.38^{+++}$

b) $\text{Index} = 1.1 \times 1.0 \times 1.0 \times 1.5 \times 1.2 = 1.98^{++}$

For circuit 4 of the crew back-up, however, the following value results -

$\text{Index} = 1.0 \times 1.3 \times 1.0 \times 1.5 \times 1.2 = 2.34^{+++}$

- According to Nicholson

a) 12.4 hours working flight time in 24 hours^{+}

b) 12.4 hours working flight time in 24 hours^{+}

3. Circuit 1 of the Crew Back-Up

- According to Mohler

Total index =

- According to Nicholson
  25.9 hours working flight time in 60.8 hours^{+}

5. Circuit 4 of the Single Crew

- According to Mohler

Leg	a Bewertungsfaktoren	Index
1 LH 508	1.1 x 1.0 x 1.7 x 1.4 x 1.1	2.86^{+++}
2 LH 500	1.0 x 1.3 x 1.0 x 1.0 x 1.2	1.56^{+}
3 LH 502/503	1.0 x 1.4 x 1.0 x 1.0 x 1.4	1.96^{++}
4 LH 507	1.1 x 1.2 x 1.0 x 1.5 x 1.1	2.18^{++}

b **Gesamtindex** : $(2.86 + 1.56 + 1.96 + 2.18)\ \frac{24}{180.8} = 1.14^{+}$

Key: a. Evaluation factors b. total index

- According to Nicholson /A5

Leg	a Akkumul. Flugdienst	b Tage	Limits c niedrig	d hoch
1 LH 508	13.5^{+}	1.0	19.5	22.5
2 LH 500	19.4^{+}	3.7	35.9	40.2
3 LH 502/503	31.3^{+}	6.2	46.9	51.8
4 LH 507	43.7^{+}	7.5	52.3	56.8

Key: a. accumulated working flight time
b. days c. low d. high

Comparison with the Regulations in other Countries /A6

The assignment and rest period regulations of the following countries were employed for the comparison: England, Scandinavia, USA, USSR and Switzerland. A check was made in each case, whether the initial and return flight for the FRA-RIO route are permitted a) with the standard crew and b) with crew back-up according to the regulations of the countries in the study. Both departure times are taken into consideration for the return flight (1940 and 0040).

1. England

CAA, Air Navigation Order, Part VI.

a) Standard Crew
FRA-RIO: not possible, since a maximum of 12 hours flight time is permitted (beginning work during the time 1800 - 2159 at the home port, no stop before the final destination).
RIO-FRA: possible only to a limited degree, since a maximum of 12 or 13 hours working time is permitted, depending on the previous rest period (beginning work at a foreign port in the time of 1300 - 0759, no stop before the final destination). When the previous rest period was 18 to 30 hours, a maximum of only 12 hours is permitted. This applies to the circuits 1 and 4 of the single crew, for which the rest period before the flight RIO-FRA is about 20 - 24 hours. A working flight time of 13 hours is possible for the other circuits.

b) Crew with Back-Up
Both flights are permitted, if each crew member has an uninterrupted rest break of 4 to 6 hours. This condition leads to an extension of the maximum times indicated under a) of 1 to 2 hours.

2. Scandinavia /A7

SOU 1972 : 82, Flygarbetstid

a) Standard Crew
Both FRA-RIO and RIO-FRA are not possible, since a maximum of 12 hours are permitted for the initial flight and 9 hours for the return flight (reduction of 12 to 9 hours, since the circuit is more than 24 hours).

b) Crew with Back-Up
Both flights are permitted, since maximum flight time of 14 hours is possible, when there is a break of 2 hours, and of 16 hours, when there is a break of 4 hours.

3. USA

FAA, Flight Time Limitations: Flag Air Carriers

a) Standard Crew
Both flights are permitted, since a maximum of 12 hours flight time (block time) is permissible (para. 121.483). According to the proposed revised regulations, however, both flights would no longer be possible, since the maximum flight time is to be reduced to 10 hours.

b) Crew with Back-Up
Both flights are possible according to both the old and the revised regulations. According to the present regulation a maximum of 12 hours flying time is possible and the flight working time is not limited. The revised regulations will limit the flying time to 10 hours and the working flight time to 18 hours.

4. USSR /A8

According to the ICAO Bulletin 5

a) Standard Crew
Initial and return flight FRA-RIO are not possible, since the flight time (block time) is a maximum of 5 to 8 hours according to the type of aircraft.

b) Crew with Back-Up
Both flights are probably possible, when the flight times given under a) are not exceeded by employing appropriate breaks. This is contradicted by the statement that a maximum of 12 hours flight time is permitted. It is not immediately apparent from the documents, however, how strictly this limitation must be maintained.

5. Switzerland

Swiss Air, Flight Operations Manual

a) Standard Crew
Initial and return flight are not possible, since a maximum flight working time of 10 hours is permitted for flights in which the time for beginning work falls in the time of 1901-0400 hours, and 12 hours for flights when work begins between 1601 and 1900 hours.

b) Crew with Back-Up
Both flights are possible, since the maximum flight working times provided under a) may be extended in each case by 5 hours.

Questionnaires and Tests /A9

In the following section of the appendix the questionnaires and tests are presented, especially compiled or developed for this study. These include a general questionnaire ("General Catalogue of Questions"), a Sleep Log, two self rating tests for a subjective evaluation of fatigue and a performance test (color names developed by Stroop). The General Catalogue of Questions is to be given to all crew members assigned to the RIO route. Participation is voluntary and is kept anonymous (as in all questionnaires and tests). The sleep log is employed for a South American circuit and provides information on sleep behavior during this time. The self rating tests are to be filled out several times before, during and after the flights (legs). The Stroop test is to be conducted twice on both the initial and the return flights FRA-RIO as close as possible to take-off and landing. The originals of this test are in color.

General Catalogue of Questions /A10

Age	20-30	O	30-40	O	40-50	O	50-60	O
Position	Captain	O	FO	O	FE	O		

1. What degree of stress would you assign to the initial and return flight FRA-GIG in comparison to your experience on other routes?

FRA-GIG	small	0	medium	0	great	0
GIG-FRA	small	0	medium	0	great	0

2. If applicable, list a flight you consider more stressful:

3. Which factor contributes most to stress:

Duration of the flight	0
Night flight	0
Shift in time	0
Climate	0
Departure time	0
Arrival time	0

4. Is there more stress on the initial or the return flight?

Initial flight 0 Return flight 0 both the same 0

5. Do you feel rested before the return flight?

yes 0 no 0

6. Which South American route do you consider

a) the most pleasant?
b) the most unpleasant?

7. Which flight would you prefer?

FRA-GIG 0 or FRA-SFO 0

8. Do you feel that the facilities for sleeping (crew bunk) are sufficient? /A11

yes 0 could be improved 0

9. Do you sleep in the aircraft?

never 0 seldom 0 often 0 regularly 0

10. Do you consider sleeping in the aircraft necessary to maintain your level of performance?

definitely 0 partially 0 not 0

11. Do you sleep well or poorly at home?

well 0 poorly 0

12. When travelling, do you have difficulty

falling asleep? yes 0 no 0
sleeping through the night? yes 0 no 0

13. Are you more alert in the morning? 0
at night? 0

14. Which solution is better for the RIO route?

Single crew 0 Crew with back-up 0

15. Should the present arrangement be retained?

yes 0 no 0

16. Are you satisfied with the present rest periods?

yes 0 too short 0 too long 0

17. In your opinion, what should be changed?

SLEEP - LOG

NAME: _____

RANK: _____

N O T E S

1) Notation of name is voluntary, but please give rank (CP,FO,FE).

2) Please complete a page each day, whether on service or at home (If possible 3 days each before and after flight schedule).

3) Mark a point on each line on getting up and on going to bed on how you feel.

e.g. 

4) Note begin and end of any NAP.

5) Use G.M.T. throughout. This helps considerably in assessing your sleep record.

6) On Completion please return to:

Dr. H.-M. Wegmann
DFVLR
Inst. f. Flugmedizin
Linder Höhe
5000 Köln 90

DFVLR-Institut für Flugmedizin
Linder Höhe
5000 Köln 90

SLEEP

DATE	G.M.T.
WAKE UP	
SLEEP DURATION (hrs.)	
GET UP●	
ON DUTY	
OFF DUTY	
IN BED★	
ASLEEP	
NAP FROM: TO:	
NAP FROM: TO:	
NAP FROM: TO:	

TIRED ●ON GETTING UP FRESH

FRESH ★ON GOING TO BED TIRED

Normal Duration
a) Average: _____
b) Range : _____

Normal Begin : _____

Normal End : _____

SECTOR FLOWN:

SERVICE NO:

/A13

NAME: _____ b Datum: _____

CP☐ FO☐ FE☐ c Uhrzeit: _____

a ANLEITUNG: Denken Sie genau darüber nach, wie Sie sich augenblicklich fühlen. Machen Sie bei jeder Frage ein - und nur ein - Kreuz ('x').

		>	=	<
d	1. SEHR MUNTER			
e	2. äußerst müde .			
f	3. durchaus frisch			
g	4. leicht erschöpft			
h	5. unternehmungslustig			
i	6. ziemlich frisch			
j	7. abgeschlafft			
k	8. sehr erfrischt			
l	9. ziemlich erschöpft			
m	10. ausgepumpt			

> : n besser als; = : o genau; < : p schlechter als

Key: a. Directions: consider carefully how you feel at the moment. Place only one cross (x) in each question.

b. date

c. time

d. very alert

e. very tired

f. quite fresh

g. slightly fatigued

h. ready for action

i. rather fresh

j. run down

k. very fresh

l. rather fatigued

m. exhausted

n. better than

o. precisely

p. worse than

Phase:

Name: Date: /A14

F/C Function Time (GMT):

Estimate your present condition using the pairs of opposites below. Express the distance from one or the other extreme by a cross on the straight line. Make an effort to describe your present state accurately.

Now I feel:

mentally exhausted	———————————	mentally fresh
drained	———————————	energetic
worn out	———————————	rested
it is difficult to concentrate	———————————	it is easy to concentrate
irritated	———————————	calm
lacking in drive	———————————	ready to undertake a task
depressed	———————————	cheerful
tired	———————————	very awake
inert	———————————	active
nervous	———————————	calm
in need of sleep	———————————	not in need of sleep
inattentive	———————————	attentive
fatigued	———————————	lively
feeble	———————————	full of spirit
exhausted	———————————	recharged

weak	———————————	ready for action
activity can only be completed (continued) with a great effort	———————————	activity can be completed (continued) with little effort

Color Names according to Stroop /A15

In the following there are two reading samples. In the first reading sample you name the colors of line patters.

		You read aloud:
Example A	(blue line pattern)	"BLUE"
	(green line pattern)	"GREEN"
	(yellow line pattern)	"YELLOW"
	(black line pattern)	"BLACK"
	(red line pattern)	"RED"

As in this example, the color names in the reading sample are read from the top to the bottom in columns. Read fluently according to your own tempo.

In the second reading sample you also name the colors you see; however, this time there is not a line pattern, but rather written color words. The difficulty is that the color seen and the color word are not identical.

		You read aloud:
Example B	YELLOW	"BLUE"
	RED	"BLACK"
		"YELLOW"
	BLUE	"RED"
	GRAY	"GREEN"

Do not let yourself become distracted by the difference between the color impression and the written word. Also read fluently in

this case at your own speed. The colors are read in columns again from the top to the bottom. Try to avoid errors.

Read the words "START" and "STOP" at the beginning and end of the following reading samples. Now wait until the sign is given to turn to the next page. Do you have any questions?

STOP!