South African Airways Suid-Africanno Lugdiens

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MEMORANDUM

CONFIDENTIAL

Technical Investigation Committee ZS-SAS "Helderborg" Accident Hangar 1 west Jan Smuts Airport.

Ref: AIR/AGC/8-B747/SAS/STABTRIM .

Tel: B-2286/3106 Date: 89/02/02

Chairman
"Helderberg" Technical Investigation Committee
"Room 516 Administrative Building
Jan Smuts Airport

ZS LAS HORIZONTAL STABILIZER TRIM POSITION AT IMPACY

Photographs taken on the sea bed of the Horizontal Stabilizer jack screw gimbal assembly revealed the following:
The upper section of the jack screw is still in the ball nut with nine grooves extending above the ball nut and four grooves below the ball nut.

corresponds with a cockpit stabilizer trim position indication of 3.5 units.

However, it has been suggested that the jack screw fracture possibly occurred at a point flush with the lower surface of the ball not and that the section of jack screw remaining intact with the ball not rotated subsequent to the event, due to its mass and the low friction characteristic of the ball not, resulting in the four grooves protruding below the ball not.

This information to be reviewed in conjunction with attached correspondence with Flight Performance Engineering relating to computed horizontal stabilizer trim configuration on IS-SAS at the time of the accident.

N.H. Massyn Assistant Investigator

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MEMORANDUM

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Deputy Manager (Weights Engineering) Flight Performance Engineering JAN SMUTS AIRPORT

Ref : AIR/MFD/14/9/1/3

Tel : 8-2512

Date : 29 March 1989

Technical Investigation Committee IS-SAS Accident C/O Room 516 Administration Building JAN SMUTS AIRPORT

ZS-SAS (SAZ93) AMENDED ESTIMATED WEIGHT AND BALANCE INFORMATION

Dur like referenced memorandum of 09 February 1989 is amended as follows:

- Estimated aircraft weight at impact
- a) Weight of departure fuel as recorded on the load-sheet = 149 000 kg
- b) Weight of trip fuel to destination as recorded on the load-sheet = 120 610 kg
- c) Difference between 1(a) and 1(b) = 20 390 kg
- d) Estimated weight of fuel for remaining = 3 980 kg
 23 minutes flying time = 3 980 kg
- e) Aircraft zero-fuel weight as recorded = 218 485 kg
- f) Estimated aircraft weight at impact; 242 855 kg = 242 855 kg
- 2. Estimated aircraft center-of-grayity at impact
- a) Zero-fuel weight index as recorded on the load-sheet = 8 390.8 index units
- b) Index unit adjustment for the estimated weight of fuel remaining on-board the aircraft; per 1(c) plus 1(d) = + 5.7 index units
- c) Estimated trim-sheet index units at impact; 2(a) plus 2(b) -= 8 396.5 index units

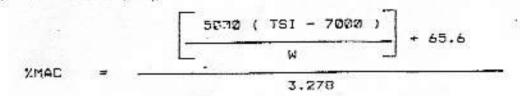
Mars of fuel in the aeroplane at the time of the impact = 1(0 - 1(b) + 1(0) = 149 000 - 128 610 + 3980 = 04370 40

= 24370 kg.

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d) Formula to convert index units to XMAC:-



W = aircraft weight
TSI = trim-sheet index units

e) Estimated XMAC at impact

= 28.78

3. Estimated stabilizer trim position at impact

Per 8747 Combi AFM, code 827, section 4, page 26, (copy attached) for an estimated aircraft weight of 242 855 kg per 1(f) and an estimated center-of-gravity of 28.78 %MAC per 2(e), the stabilizer trim position will be approximately 3.1 units.

- 4. Estimated stabilizer trim position if passengers in zones C and D move forward
 - a) With reference to Assistant investigator N. H. Massyn's memorandum AIR/AGC/8-B747/SAS/STABTRIM of ØZ February 1989, we offer the following for your consideration:-
 - b) This estimate is based on the following, 1. the 20 rear most passengers in zone C move forward; 2. all 66 passengers in zone D move forward.
 - f(z) The weight of 86 passengers at 80 kg per passenger = 6 880 kg
 - d) The centroid for these 86 passengers (assuming they were seated in their allocated positions) + BS 1419
 - e) The center-of-gravity change is calculated by using the following formula:-

DELTA TS1 = . WEIGHT X DELTA ARM

ARM = Body station

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f) This table summarises the effect the centroid of 96 passengers moving from BS 1419 to various forward positions will have on the aircraft trim,

RESULTANT TSI	RESULTANT XMAC	RESULTANT STABILIZER TRIM
6 994.4	20.0	5.1
7 132.0	,20.8	4.9
7 269.3	21.7	4.7
7 407.2	22.6	4.5
7 544.8	23.4	4.3
7 682.4	24.3	4.1
7 920,0	25.2 ,	3.9
	7 132.0 7 269.6 7 407.2 7 544.8 7 682.4	TSI XMAC 6 974.4 20.0 7 132.0 20.8 7 269.8 21.7 7 407.2 22.6 7 544.8 23.4 7 682.4 24.3

8095.2 27.0

Refer to attached trim-sheet for the above points.

It therefore appears feasible that the stabilizer trim could have been 4.75 units, indicating that passengers had moved forward.

Note that with the centroid for the 86 passengers being at 85 400, the eircraft would have been well within the certified trim envelope limits.

with all 159 passengers and crew concentrated in zone A, the resultant TSI is 6728.8 units and the aircraft remains within the forward trim limit (refer to point "A" on the attached trim-sheet).

WHY THESE CARCUMENTS OF PAY. WISE NO 1-3 CAPPLE OF PAY. Brook House ON ANDLAST?

H. A. Valkenburg

Deputy Manager (Weights Engineering)

FLIGHT PERFORMANCE ENGINEERING