Section 4
STEPS TAKEN AND ADDITIONAL RECOMMENDATIONS

Foreword:

The following recommendations convey the information that the Commission believes can be drawn from its analysis of the accident, in order to improve aviation safety. They have been formulated with reference to in-depth investigations, and are thus based on knowledge and understanding which may be considerably different from the knowledge and understanding the various parties had access to prior to the accident. On the other hand, in these measures, the Commission has chosen to err on the side of safety. For this reason it has not restricted the scope of its recommendations solely to the points connected with the accident relative to direct or demonstrable causes, neither has it chosen its main line of thought based on the only hierarchy of probability that it has been able to link from other sources to the various theories of the scenario.

CHAPTER 4.1 – RECOMMENDATIONS CONCERNING THE CREW

41.1 – Information from the crews regarding the conduct of the flight at the time the descent began

On 20 February 1992 the Commission approved "the first provisions taken immediately by the DGAC to inform the Operators of the risk of confusing the Vertical Speed and Flight Path Angle modes, and asking them to check the protection afforded by their working procedures as a crew, their documentation, and the crews' knowledge."

To explain the descent at an unusually high rate, the Commission has retained several theories, including the theory of an unintentional command by the crew, as a result of an incorrect knowledge of the Autopilot vertical mode. This theory encompasses several variations, mainly concerning the choice of vertical guidance mode, its command, and its control by the crew.
It would therefore appear to be necessary to ensure that adequate procedures for the conduct of the flight are taught to the crews.

Accordingly, the Commission of Investigation confirms the preliminary recommendation of 20 February 1992 quoted above.

41.2 – Matching crews

The Investigation has shown the lack of relevant experience of the two pilots of F-GGED (162 hours and 61 hours for the

captain and co-pilot respectively). From other sources it has established a probable link between this lack of experience and the fact that the pilots were unaware of the serious error of their vertical situation. More generally, accident statistics and ergonomic studies alike indicate that about one year's relevant, active experience is necessary to acquire a fully mature understanding and knowledge of new-generation aircraft. Thus, forming a crew using two inexperienced pilots constitutes an increased risk factor.

When a company brings in a new aircraft type, all its pilots are inexperienced. Later, however, it is possible to see to it that the total experience of the crew is above a certain threshold. Current French regulations do not include a clause encouraging or obliging Operators holding a public transport licence to ascertain how much relevant experience on type pilots have, when matching up crews.

Consequently, the Commission recommends:

– that Operators should study and apply methods of managing air crew personnel to prevent, as far as possible, selecting two pilots both of whom lack experience with the particular type of aircraft;

– that the DGAC, in conjunction with the competent authorities in Europe and the relevant international bodies, should apply appropriate measures to encourage this and, if necessary, further develop regulations in this regard.

Note 1: Since April 1992, Air Inter has enforced a regulation regarding the composition of crews, forbidding the selection of crews consisting of two "novice" pilots on the A320. A pilot with fewer than 300 flying hours on the A320 is considered a "novice", and this minimum is increased to 500 hours if the pilot has less than 1000 flying hours in total, either as captain or co-pilot before entering the A320 sector.

Note 2: As one notable result of an NTSB recommendation of 3 November 1988, the FAA published an NPRM (Notice of Proposed Rule Making) on 23 March 1993 regarding minimum experience required for pilots of flights covered by the regulation FAR 121.

41.3 – Teaching the So-called "Standard" Approaches

It emerged from the Investigation that there was a certain

reticence on the part of the captain as regards a VOR-DME approach, as well as some evident deficiencies in the execution of this approach on the part of the crew. It also emerged that the training received by the two pilots when they qualified for this aircraft type was more geared towards automatic approaches and failures, than towards "standard" approaches. On the one hand, the execution of these approaches can be just as challenging on the latest generation of aircraft, and on the other hand, the infrequence of their occurrence in service tends to lead to a resultant lack of training.

However, the present criteria for approving courses giving qualifications for an aircraft type, do not include specific requirements in the area of the "standard" approach.

Consequently, the Commission recommends:

– that the DGAC should encourage the relevant bodies to emphasize so-called "standard" approach training both quantitatively and qualitatively, by defining regulated minimum levels appropriate to the qualification for the aircraft type and to the refresher courses, and a desirable minimum for the in-service cross-training programme.

41.4 – Simulator Practice for Anomalies Linked to On-board Software and in EFIS.

Analyses carried out while attempting reconstruct the scene of the accident have led to speculation concerning errors on the part of the on-board software or the EFIS (faults concerning VOR or DME information, the navigation map, the FCU, etc). Some of these errors are acknowledged on the certificate together with the related criteria on the understanding that the crew will recognize these and handle them appropriately. This assumes that courses leading to a qualification for the aircraft type and refresher courses cover these aspects appropriately.

However, the directory of failures currently available on flight simulators does not allow for simulating some of the anomalies mentioned above.

Consequently, the Commission recommends:

– that training courses and tests should be revised to include scenes of faults in specific situations using onboard software and EFIS, based on experience;

– that the relevant authorities approving simulators should undertake to revise the proposed directories of

failures to take into account specific faults connected with on-board software and EFIS.

41.5 – Transition from Classic Aircraft to New-Generation Aircraft

The two pilots of F-GGED had no experience whatsoever of new-generation aircraft before beginning their training on the A320. Moreover, their previous experience was of aircraft piloted by a crew of three. In the opinion of the Commission, this amounts to a major new experience, hardly comparable to coming onto a new type of aircraft of the same generation. In this regard the Commission has noted the existence of a preparatory module in Air Inter's training course (known as STAN), before actual qualification for the aircraft type. The Commission agrees with the principle, however with a few provisos (cf paragraph 23.134) concerning its heavily technical, theoretical content and presentation.

Consequently, the Commission recommends:

– that when an Operator introduces an aircraft or equipment involving a major fundamental change in operational techniques, the Operator should ensure preparatory training is given covering at least:
1) the principles of the concept, architecture and philosophy behind using the new systems;
2) the effects of the new innovation on how the crew work together, new division of tasks, communication between the crew on the aircraft and the ground crew;
– that this training should be based around a practical, operational presentation of the new functions;
– that the relevant bodies approving courses leading to a qualification for the aircraft type and the methods of crew training ensure that these principles are put into effect.

Note: With effect from September 1993, Air Inter has decided to amend the contents of its cross-training course for new aircraft (STAN) to present it as less academic and more geared towards operating new-generation aircraft.

41.6 – Training in Human Factors

Analysing the behaviour of the crew of F-GGED has shown considerable deficiencies in the areas of communication, division of tasks, cross-checking and observing the automatic functions. In fact, in the Commission's view, the crew's teamwork was one of the main factors in the accident.

French regulations do not at present legislate on training

crews in the area of human factors, in particular the management of the resources available in the cockpit.

Consequently, the Commission of Investigation recommends:

– that theoretical and practical training in human factors should be introduced into the initial training a transport pilot receives, for example as specified in Appendix 1 of the ICAO;

– that Operators holding a public transport licence should quickly introduce "CRM"-type (Cockpit Resource Management) complementary training courses for all their pilots, if possible right from the stage of qualifying for the aircraft type;

– that the relevant bodies make appropriate arrangements for incentives and regulations to bring this about;

– that tests of competence carried out by the Operators and in-flight testing carried out by the authorities should include how well the crew works together, as main testing criteria.

41.7 – General Comments on On-Board Announcements

The Investigation showed that during the flight that ended in the accident, there were significant deviations from the procedures for announcements required by the company. It emerged in the analysis that a lack of announcements could have contributed to the lack of manual checks and therefore the knowledge each pilot had of the actual situation.

More generally, it appears that in the airline's every-day practice, the average reproduction quality of announcements could be lower than intended, although the extent of the phenomenon and reasons for it are well known. Manual checks are by nature vitally important to safety, especially on the latest generation of aircraft.

Consequently, the Commission recommends:

– that a study of the everyday practice of announcements should be undertaken, together with analysis of the reasons for violations by novices in this area, and a study of sufficiently stable methods and procedures within the time for monitoring automatic functions at high altitudes, as well as for cross-checking within the crew.