

AIRCREW INTEGRATED MANAGEMENT

A.I.M.

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Abstract

In this paper we present the Human Factors module that has been introduced by Aeroformation in its transition course for flight crew members.

It's a very interesting experience because :

- it's the first time that such a module is implemented in a manufacturer's transition course,
- it's fully integrated all along the stay of the trainees in the learning center (five weeks),
- it's attended by a very large sample of population coming from all around the world.

AIM is very well received by all our trainees, even those who have been yet exposed to a CRM course, because they feel that it is a good recurrent training.

Our simulator instructors and flight instructors have noticed some changes in the behavior of the trainees, related to the use of the AIM's concepts and skills.

Up to now this module has been used for A320 training, and as soon as we will have trained new facilitators, it will be implemented in A310 and A340, A330 courses.

We intend also to extent the concept of Human Factors to our Maintenance transition courses.

1. Introduction

1.1 The Human Factors aspects and the Crew Resource Management concepts have been taken in account in all our flight crew transition courses, from the beginning of Aeroformation, and well before the implementation of a formal CRM module in these courses.

For instance the general philosophy of the course, explained to the trainees in the Flight Crew Training Manual (FCTM), is that "since crew members are bound to work together in an aircraft, the crew is considered as a unit as far as training in procedures and aircraft handling is concerned".

In this FCTM a chapter is specially devoted to the two crew member philosophy ; in this chapter we can note the following points, very important in the crew resource management training :

- . crew communication
- . crew coordination
- . cross check
- . discipline

Throughout the Fixed Based Simulator (FBS) and Full Flight Simulator sessions (FFS) the instructors check that the trainees apply these concepts, and moreover in certain exercises they check that the process of challenge-response, very clearly and precisely written in the procedures, is strictly respected.

1.2 Before taking the decision to implement a Human Factors module in our transition course, we examined and attended several CRM courses in order to have a good view of the state of the art in this area. We also met scientists and professors studying the CRM questions, mainly those related to advanced technology cockpits, read all the publications on the subject, and attended many conferences and symposium.

Finally we took the decision to work with Flight Safety International, FSI ; one of the reasons of this choice in our approach of Human Factors, is that the FSI's course and experience were well adapted to the large diversity of population to be trained in Aeroformation, and rather easy to be customized to our exact needs and ideas.

In June 1990 we made a press release to the international aeronautical press to present this project.

In this paper, Captain Jean PINET, President of Aeroformation, stated that "Aeroformation has been investigating various Human Factors, CRM programs for well over one year. We have recognized that our transition training programmes are specifically airplane oriented and that the Human Factors training is aligned to longer terms behavioral education. However, in the two man cockpit we need to emphasize the Human elements that are necessary in crew management strategies. Since attending the ICAO Human Factors seminar in Leningrad this past April, we reached the decision that we must move forward into this still evolving environment and be activist in funding aviation solutions".

Finally we elected to give at this course the name of Aircrew Integrated Management, with the acronym AIM.

2. AIM course development

2.1 First of all, why did we choose this acronym, AIM for our CRM course ?

Generally speaking, all CRM courses have a two, three or four days duration, but for us it was very difficult, and almost impossible, to ask airlines to send their pilots two or four more days for their transition training. We also know very well that to be effective a CRM course needs to be reinforced by recurrent training, that is possible in the airlines, but not in Aeroformation because after the transition course we "lose" the trainees.

So to face those two constraints, we elected to divide our course in a one day workshop, and to reinforce the concepts studied during that day or to introduce new concepts, during the briefing and/or debriefings of some simulator sessions. So the course is fully integrated during all the stay of the trainees in our center.

Also as Captain PINET said in his press release, we want to emphasize during our transition course, the human elements that are necessary in aircrew management strategies, and so our course is necessarily integrated in the whole cursus, as for performance, systems, and

so on.

And finally this acronym means that we aim to add a new dimension to our transition courses.

2.2 AIM development

It is important to establish an understanding of the necessity of human factors training for flight crews.

A flight crew is assigned the responsibility to maintain the operational integrity of each flight. Operational integrity is composed of six specific requirements :

- SAFETY : the crew is expected to operate the flight in the safest manner possible.

- EFFICIENCY: the crew is expected to operate the aircraft as efficiently as possible. This includes minimizing stress to the aircraft, efficient use of fuel and so on.

- SCHEDULE : the crew is expected to operate the flight as close to schedule as possible, with proper consideration for other factors such as safety and passenger comfort.

- COMFORT : the crew is expected to provide the most comfortable flight possible for the passengers.

- REGULATIONS : the crew is expected to comply with applicable government regulations and operate the flight accordingly.

- OPERATIONS SPECIFICATIONS : the crew is expected to comply with applicable company operating policies, guidelines and specifications and operate the flight accordingly.

As the "Flight Crew Performance Model" (fig 1) illustrates, two crew performance components are necessary to achieve operational integrity.

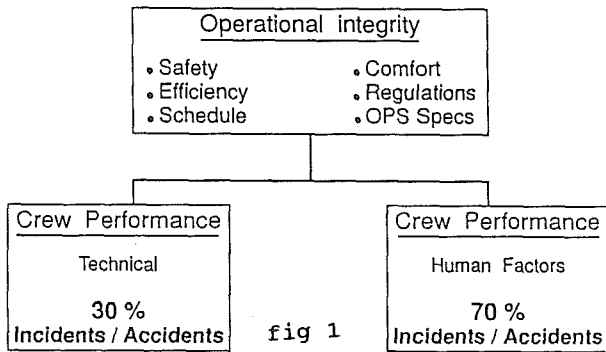


fig 1

The first is a technical one. Technical crew performance is the focal point of most pilot training programs and an area where the airline industry has traditionally excelled. Key elements of this type of training and checking include aircraft systems knowledge, knowledge of procedures and flight profiles. The effectiveness of technical crew training is evidenced in the fact that only 30 % of the incidents and accidents involving professional crew members are attributable to technical crew performance failure.

The second component of crew performance is a human factors one that requires flight crews to develop non-technical skills that influence technical crew performance. Relevant non-technical skills include communications, team building, decision making and stress management. However, these non-technical skill areas have not been part of traditional training programs. Instead, individual crew members have been left to their own intuities to develop "crew coordination" strategies. As a consequence, roughly 70 % of incidents and accidents that have occurred in recent years are attributable to human factors crew performance failure.

It seems clear that a focus on human performance and how it can be enhanced is appropriate. This is the purpose of CRM training.

Analysis of recent trends in accident statistics gives more compelling evidence of the need to address human factor issues in pilot training programs.

Since introduction of jet aircraft into commercial transport service, there has been a sharp decline in the accident

rate. In fact, it can be said that the world's airlines provide the safest means of transportation available today.

However, since the early 1980s, the accident rate has not improved. While the system is very safe, it is not getting safer. At the same time, flight activity is increasing. As flight hours increase in the face of a steady accident rate, the gross number of accidents will grow, as illustrated by figure 2.

Trends in Accident Statistics

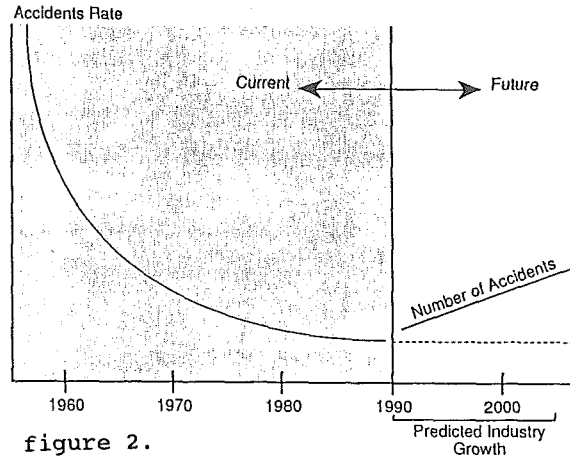


figure 2.

What can explain this failure to improve the overall accident rate in recent years? Is it possible that we have maximized the effectiveness of technical training solution to the point that system safety has been maximized as well? Perhaps, human factors solutions, rather than technical solutions, offer the most fertile opportunity for improvement.

Hence, the concept of AIM training to integrate with technical training, the non-technical skills addressed in CRM training.

. AIM design process

The AIM program was designed through a cooperative effort between Aeroformation and Flight Safety International. Each brought important and unique experience to the process. Aeroformation contributed its broad expertise with the A320 and other Airbus aircraft and its experience in training Airbus flight crews. Flight Safety contributed its considerable experience in cockpit resource management and flight crew training.

The AIM program is based on a two-day CRM workshop which has been used successfully by Flight Safety for several years. The two days course was then highly modified to customize it to the specific requirements of the Airbus family of aircraft.

After careful analysis, it was decided that AIM should be composed of three distinct elements.

The first is a one-day AIM workshop. This course occurs immediately prior to beginning A320 VACBI training. It is highly interactive format that relies heavily on discussion, exercises and group activity rather than lecture. The workshop will be described in more detail shortly.

The second two elements reflect the importance of integrating human factors considerations into the normal technical training curriculum. As a result, five sessions in FBS-B and three sessions during FFS training include dedicated AIM training activity.

. Facilitator training

The one-day AIM workshop is conducted by a group of six Aeroformation staff. These people are called AIM facilitators, rather than instructors, to represent the unique style of training used is an AIM workshop.

Facilitator training was accomplished in two distinct, but related phases. During phase I, each facilitator participated in ten days of training allowing them to become thoroughly familiar with the concepts and instructing techniques used in CRM type training programs. During phase I, each facilitator received initial CRM training and then began the process of becoming a qualified facilitator. They also provided valuable input to the AIM course structure which was undergoing final design.

Phase II of facilitator training accomplished final qualification as an AIM facilitator. During this phase, each facilitator became an expert in all elements of the Aeroformation AIM course. This phase involved sixteen days of training which ultimately led to full qualification of each facilitator.

. Instructor training

The unique feature of AIM is the integration of human factors training with technical training. This is accomplished during eight specific FBS-B and FFS training sessions. Accordingly, it was necessary to train simulator and flight instructors in AIM and their unique role in providing this training to Aeroformation pilot trainees.

Instructor training was accomplished in two phases, similar to the fashion of the facilitators.

In phase I, each Aeroformation instructor received three more days of training. This included a two-day CRM course followed by a briefing on the AIM project and the instructors' role in AIM training.

Approximately four months later, each instructor received three more days of training. This included the one-day AIM workshop followed by a special two-day instructor course. At the session, instructors were taught how to brief, observe, evaluate and debrief AIM performance during FBS-B and FFS sessions. At the conclusion of the training, each instructor was able to demonstrate their ability to use this material in training.

. Design process = Summary

The AIM design program began in July, 1990 with the final course being delivered in January. In January thru March, 1991, all Aeroformation instructors were trained and the customer training began in April 1991. AIM training at the Airbus Training Center in Miami began in October, 1991.

3. AIM presentation

3.1 General

As we said previously the program designed to be fully integrated into the Airbus transition training program includes a one day workshop followed by emphasis on AIM techniques during FBS and FFS training.

Several concepts are studied, but as we think that an effective cockpit

management results in a high level of flight crew situational awareness, this concept is the key theme of AIM.

But we don't want just to give theoretical concepts and AIM is designed to be a practical training, focused on skills and tools that can be used in the cockpit, so all the ideas learned will be applied by the trainees during the simulator session.

3.2 One day workshop

This workshop features short lectures, many facilitators and participants-led-discussions, problem solving exercises, case studies of actual accidents, and a series of three constructive videos to illustrate Human Factors behaviour taught during the workshop. This workshop is a very dynamic, ever expanding program for both the participants and the facilitators, it is scheduled on the second day of training.

It is led by two Aeroformation facilitators that have been specially trained and qualified for this purpose, and contains a minimum of lectures. It comprises mostly discussions, exercises and watching videos.

Concepts reviewed include :

- Situational awareness (lecture, slides)
- Error chain (idem)
- Error chain (exercise)
- Communication (idem)
- Communicating skills (lecture)
- Barriers to communication (exercise)
- Synergy and crew concept (lecture)
- Synergy (exercise)
- Accident case studies (exercise, video)
- cockpit behaviour (3 part video)

Before the workshop begins, trainees are asked to complete a questionnaire related to a NASA/University of Texas study, on cockpit behaviour (CMAQ : Cockpit Management Attitude Questionnaire). The same questionnaire is completed at the end of the transition course, at FFS6, so that it is possible to measure the change in behaviour due to training. This study is done worldwide and UT provides us with our own results compared to those of the rest of the aeronautical community. It is a powerful tool to improve our course. (See chapter 4)

At the end of the day, facilitators make a summary of the day and get the comments from trainees.

3.3 Simulator training

During the briefing of some of the simulator sessions, the instructor reinforces concepts studied during the one day workshop or introduces new ones.

The schedule is as shown and the choice of the subject is related to the technical content of the session.

FBS	5/10	: briefing - new
FBS	11	: workload management and task sharing - new
FBS	12	: situational awareness and error chain - review
FBS	13	: communication - review
FBS	14	: stress ; developing a situation awareness plan to be used during the FFS session - new
FFS	3	: reliance on automation - new
FFS	4	: synergy and crew concept - review
FFS	6	: decision making and judgment ; problem solving situation - new

AIM post course survey

4. AIM feedback

At the last FFS session (FFS 6, just before the evaluation at FFS 7) trainees respond to a survey of 21 questions, allowing us to know what they think of the course and of the various items that form it.

The result of this survey keeps evolving, as each week we add data from a course of 10 pilots.

Up to now the main results are very good and very encouraging.

For instance at the question "Overall, how useful did you find this training" (one day workshop plus simulator briefings), nobody responds "waste of time" or "slightly useful", only 5.3 % respond "somewhat useful", and 57.9 % respond "very useful", and 36.8 % respond "extremely useful" (fig 3)

AIM Feedback

Results in % of each item	Waste of time	Slightly useful	Somewhat useful	Very useful	Extremely useful
Average rating of the items of the one day workshop	1,4	7,3	30,3	38	23
Usefulness of the one day workshop	0	6,9	31	48,3	13,8
Average rating of the briefings during simulator sessions	0,8	1,6	19,2	46,4	32
Overall how useful did you find this training	0	0	5,3	57,9	36,8

fig 3

The average rating of the items of the one day workshop and of the briefinf during simulator sessions, is also very good, with often a better rating for the second than for the first ones. That shows that the idea to divide the course in two parts, and to use the simulator sessions to review concepts or introduce new ones, was a good one.

The results are as follows, with first the percentage for the one day workshop, and second the percentage for the briefings sessions :

Waste of time	: 1.4	0.8
Slightly useful	: 7.3	1.6
Somewhat useful	: 30.3	19.2
Very useful	: 38.0	46.4
Extremely useful	: 23	32

When we compare all these results to those of other CRM courses existing all around the world (by reading press articles or communications made in symposiums or seminars), we understand that our course is very well received by our trainees and highly rated by them.

For instance, in a communication of the ICAO seminar of Leningrad in April 1990, we note that for the question "Overall how useful did you find this training" for two airlines there was 2 % waste of time", 5 % "slightly useful", 25 % "somewhat useful", 48 % "very useful", and 21 % extremely useful, compared to us at 0-0-5.3 - 57.9 and 36.8 %.

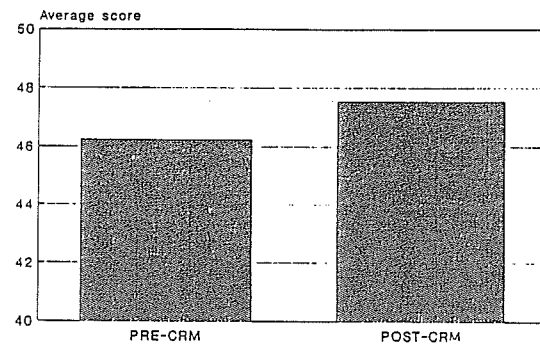
Also, a sign of great interest of our customers for this course, is that two airlines wish to extend this course, given up to now to their trainees coming to Aeroformation, to the other pilots having trained before the implementation

of AIM or being trained in the airline itself.

Another interesting feedback is that the pilots of one airline having a CRM course in house, find that our course is very powerful as a recurrent or refresher training.

As we said in § 3.2 we have a very interesting feedback with the results of the CMAQ. For instance we can see in fig. 4 that there is an improvement between Pre AIM attitude and Post AIM attitude regarding the concepts of Communication and Coordination.

Attitude change on the CMAQ
"Communications and Coordination" Scale



Scale range: 11-55
p.03

fig. 4

This is conforted by the observation of our simulator instructors and training Captains, who really see a positive difference in behavior in these areas between the trainees having attended AIM and those not having done so.

We have also obtained a good result in the expected change of behavior on the flight deck (in the real life instead of in simulator during training) due to AIM training. Fig 5 shows that 41 % expect a slight change, 39 % a moderate change, 12 % a large change, and only 8 % no change.

How much is the training going to change your behavior on the flightdeck?

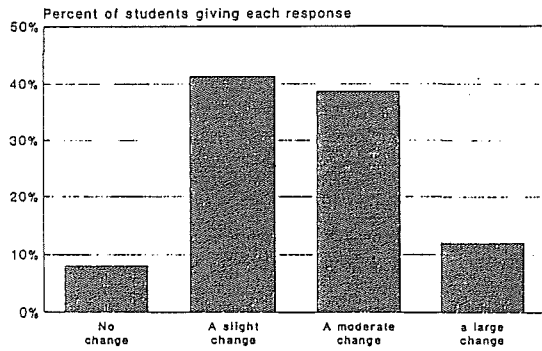


Fig 5

This is a very good result for the first exposure to a CRM course, that is the case of the majority of our trainees, as it is well known that a large change of behavior is only expected after different steps of training and recurrent training.

5. Conclusion

Aeroformation is very happy to have implemented this CRM course, to enhance the safety in the cockpit, and to also help the trainees to have a better success in their check, by the use of a better crew working.

This course will not stay as it is today, and due to the feedback of the trainees, it will be improved as much as possible. For that, we plan an annual revision, made with the help of all the simulator instructors and of the facilitators group. Today the first one has yet been implemented.