

Chapter 7 – INSTRUCTORS

7.1 INTRODUCTION

The objective of this chapter is to provide some practical guidelines to the instructors who are involved in aeromedical and physiological training on countermeasures to spatial disorientation (SD). The role of the instructors, who are responsible for the theoretical explanation of SD and the technical supports, and who conduct the practical exercises on SD, is defined. We will begin by identifying the qualifications that are needed to perform SD training on aircrews. This will be followed by general guidelines in the development of optimal strategies at different stages of the training program.

As stated in the preceding Chapter 6 (Optimisation of SD training), it is possible to categorise SD training in at least two consecutive phases.

- Basic training in spatial orientation: aiming to provide student pilots with basic information on the physiological and psychological factors involving spatial orientation and disorientation.
- Advanced training or refresher training at the operational squadron level: aiming to provide pilots with a brief review on the SD phenomenon with emphasis on the application of SD countermeasures during operational scenarios.

Instructors involved in these two phases of SD training will consequently have to possess different theoretical and practical background in order to use different approaches.

7.2 PERSONNEL

During basic training in spatial orientation, a strict correlation and explanation between the anatomy and physiology of human sensory systems and some of the corresponding illusions is mandatory. Moreover, practical clinical examples of the function and malfunction of our sensory systems would be helpful, to explain our responses to altered sensory inputs. In addition, different types of illusions from the standard neuro-psychological practice can evoke interest in the trainees, even if they are not strictly related to flight operations. Therefore, instructors with a biomedical background would be suitable to conduct this training phase, for example, flight surgeons, flight physiologists and neuro-psychologists. On the other hand, examples and explanations given in relation to flight operations should be limited to simple situations, because of the trainees' lack of flight experience. For this reason, the instructor's knowledge background in flying may not have to be extensive; however, knowledge of epidemiological studies on the causes of flight mishaps in military and civil aviation could serve as a useful introduction to the more detailed information on specific illusions (cf. data in previous chapters, and [5]). It is desirable for instructors with biomedical background to gain flight experience and have a direct contact with operational flight squadrons.

As cited in Chapter 6 on SD Training Optimization, this early part of the training on SD can further be divided into several steps; in accordance with the progression of flight activity and experience (e.g. only introduce certain illusions when night time flight activity is undertaken). Cognitive processes underlying orientation and disorientation are an important concept for the advanced course, where situational awareness plays a prominent and understandable role. Therefore, instructors with background and experience in flight activities (i.e. pilots, navigators) or experience in the management of situation awareness (e.g. neuro-psychologists) are appropriate. However, these instructors should possess sufficient knowledge of the physiology of the sensory systems as applied to flight. The Aerospace Physiologist certification is one of the possible alternatives that can provide sufficient theoretical background in these professional areas. Previous flight experience on the part of instructors will also facilitate a familiarization with trainees and also the use of an adequate flight terminology.

The practical part of the training program requires dedicated technical personnel, particularly skilled in the use of the SD training devices in the respective laboratories and training centres. This is extremely helpful in fostering a confidential relationship between program instructors and student pilots. Therefore, in selected cases where technicians have a sufficient theoretical background, as in the case of Flight Physiology certified personnel, they can assume primary responsibility. In such cases, the inclusion of the theoretical explanation of the various SD phenomena demonstrated by the various devices would be advantageous. The mechanism of spatial orientation and disorientation can either be disseminated prior to, simultaneously, or in some cases, after the practical demonstration and hands-on training. The following Table 7.1 summarises the role of each professional background during the various training steps.

Table 7.1: Personnel Suggested for Basic and Advanced SD Courses

	Basic	Advanced
Physicians, Flight Surgeons	Suggested	Not required
Pilots/Navigators	Not required	Suggested
Physiologists and Neuro-Psychologists	Not required	Suggested
Technicians	Suggested	Suggested

It is of utmost importance that the stimuli employed in the training do not induce severe discomfort such as nausea and vomiting for the trainees in order to maintain an acceptable level of interest, to avoid negative influence on the observers and to allow the trainee to proceed to the next level of the program. If flight simulators are used to illustrate some forms of SD illusions, it is essential that the instructors provide detailed explanation of the mechanisms employed by these simulators to re-create the illusion. Also a distinction should be made between simulated and actual flight scenarios so that the lack of realism in a simulator does not compromise the training outcome. In addition, exercise in flight simulators should follow those using other laboratory tools (e.g. Barany chair, off-axis rotatory chair, and others), so that the physiological mechanism underlying the illusion can be understood and experienced by the observers and the trainee.

Different characteristics of the training activity will depend on the instructors' professional background, and are summarized as follows:

7.2.1 Flight Surgeons, Physicians (In General, Instructors with a Life Science Background)

Their task is to provide simple and accurate information about the physiology of the different sensory organs involved in spatial orientation. During the lesson, practical examples should be given, including some clinical aspects of sensory dysfunction and intra-sensory conflicts. Moreover, the easy-to-understand physiological basis of simple illusion will be given during the basic course. The appropriate use of aeronautical or aerodynamic terms will be helpful in creating a good rapport with the trainees and enhance communication, especially when the physician is dealing with the more experienced aircrews in the advanced training phase. The major technical characteristics of modern aircraft cockpits (e.g. NVG use or infrared systems) should be part of the instructor's knowledge, due to the influence of these systems on flight and health safety issues.

7.2.2 Pilots/Navigators

This category of instructor does not require significant updates about aeronautical terminology or in-flight systems. On the other hand, an insight on aeromedical physiology and/or psychology is absolutely

necessary. The “aerospace physiologist” certification, although strictly required for this category of trainer, is not *per se* sufficient to assume that they have adequate knowledge regarding SD instruction. Therefore, dedicated training in the SD phenomenon together with a sufficient period of on-the-job training will be essential. This category of instructors would be extremely desirable if advanced disorientation profiles are simulated within a Full Flight Simulator (e.g. to re-create scenarios where SD mishaps occurred, or to conduct the training into particular simulated situations, see also Section 3.5).

7.2.3 Neurophysiologists/Neuropsychologists

Many neuropsychological factors play a role in SD mishaps. Therefore, the modern approach to the cognitive/psychological aspects of SD must be emphasised, specifically in advanced orientation training programs. Such a factor implies that selection of specialized personnel with human neuropsychological behaviour background can contribute to the training program.

7.2.4 Technical Personnel

The various laboratory tools, especially the ones with advanced level of sophistication and of instrument complexity, (for example, state-of-the-art flight simulators) require dedicated technical personnel who are familiar with the operation and general maintenance of these devices. As mentioned above, these personnel, with proper certification such as the Aerospace Physiologist certification, can assume responsibility of part of the training, under the supervision of more qualified personnel. However, their participation should be limited to the practical exercise.

7.3 CERTIFICATION

Finally, the Aerospace Physiologists certification is an important qualification that usually ensures adequate knowledge on several aeromedical aspects of flight. SD is one of the topics to be covered during this course, together with hypoxia, human response to acceleration and others. The course usually lasts a few weeks and is excellent for the purposes of general aeromedical physiology training. However, it is normally not sufficient to gain an in-depth understanding of spatial orientation and SD countermeasures training. We recommend that Aerospace Physiologist certification course will suffice as the basic preparation (especially for non-medical instructors) but that it should be followed by appropriate practical experience in the training centre for spatial orientation.

