

Preface

Industrial Neuroscience refers to an emerging area of science where state-of-the-art methodologies are applied in real working contexts, in order to evaluate the internal cognitive and emotional state of human operators. In particular, aviation is one of the industrial contexts that mainly benefit from the use of neuroscience's knowledge and technologies. With the generic term 'aviation' is indicated here as an area of research that includes both the study of personnel involved in piloting aircrafts or helicopters, and the personnel involved in managing the air traffic, i.e., Air Traffic Controllers. The importance of using neuroscience in aviation relies on the fact that nowadays several studies have demonstrated that the main cause of accidents in aviation are due to *Human Factors* (HF). This happens because humans are the least and last controllable factor in the activity's workflows, and the availability of tools able to provide objective information about the user's cognitive state should be very helpful in maintaining proper levels of safety and improve human-machine interactions. To proper illustrate how applied neuroscience could help in this process, the book will cover three topics—all of them intrinsically connected. The first one is focused on the most important and investigated mental states in aviation. In particular, state-of the-art descriptions of the mental workload, cognitive control behavior, and training will be provided. The second topic of the book is dedicated to the experimental environments in which the presented research activities have been performed, the methodologies and machine learning-based algorithm developed to objectively assess the considered operator's mental states along the execution of tasks. In particular, the developed algorithm has been studied to address two important limitations: (i) overtime reliability (no recalibration of the algorithm); (ii) automatic brain features selection to avoid both the *underfitting* and

overfitting problems. In the final part of the book, an overview of the results will be provided. The experiments have been initially run in controlled environments involving voluntary students, whilst the final tests have been carried out in realistic environments recruiting professional personnel.

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Industrial Neuroscience in Aviation

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