Preface

For they had learned that true safety was to be found in long previous training, and not in eloquent exhortations uttered when they were going into action.

—Thucydides, 'The History of the Peloponnesian War,' circa 404 BC.

The practice of airworthiness is a complex one, and I doubt that anybody anywhere in the world can truly be said to understand the subject in its entirety. However, there are many people who need to initially study, and then to practice various trades within this professional umbrella.

I've worked in the field of airworthiness in its many forms since about 1989 when as a young engineer at the Royal Aerospace Establishment (RAE), Farnborough I was asked to look into the reasons why engine mounting bolts kept failing on a prototype experimental aeroplane—I rapidly discovered that this was an area in which every one of the subjects I'd studied—structures, materials, aerodynamics, writing, drafting, maths et al came together and still left my knowledge base lacking. Over the years since, I've been called upon to consider whether a wide variety of aircraft—both new and existing—were safe and fit for purpose, or in other words airworthy. Mostly this has involved in-depth consideration of individual aspects of an aircraft design; a specific instrument or system, the landing gear, the flying qualities or the flying controls for example. However, in 1997 I was appointed by the British Microlight Aircraft Association as their Chief Technical Officer, a post which I held until 2005 and required me to routinely consider not any specific aspect, but complete aircraft designs, often starting from little more than a rough set of drawings—but with the ultimate objective of an approved and flying aeroplane. This post was unusual in that the comparative simplicity of microlight aeroplanes allowed me an oversight of the whole airworthiness process in a way that the complexity of modern aircraft denies to most modern engineers.

Whilst I was employed at BMAA, I was asked by Sheffield University to teach a basic course to their undergraduates in Aerospace Engineering in aircraft certification; this was a great honour, but also concentrated my mind on how one can go-about breaking down the skills of the airworthiness engineer and teaching them. About the same time I was finishing a long-term personal project—a PhD thesis

entitled “airworthiness evaluation techniques for small light aeroplanes”, which did much the same thing. As one might expect, I referred regularly to many textbooks, and to a greater extent to airworthiness standards published by various civil and military authorities in the course of this work, however mainly I found myself using my increasing store of personal notes and experience.

Then, in 2005 I made the decision to change career and became a lecturer at Brunel University in London, teaching aeronautical engineering. Unsurprisingly, this brought a further request to teach the subject of airworthiness. About this point, I finally realised that there simply was no coherent textbook describing the fundamentals of airworthiness practice, and in particular, initial airworthiness: the methods by which the fitness for service of a new design is established: to me this was a problem.

In 2008 I moved yet again, and at the present whilst I continue to engage with Brunel, Sheffield and the BMAA, I now manage FAAM: the Facility for Airborne Atmospheric Measurements which operates the UK’s BAe-146 Atmospheric Research Aircraft. My previous experience has become invaluable in understanding the complex airworthiness processes that sit behind Europe’s most complex research aeroplane, but I’ve certainly learned a lot of new things to do with managing a jet airliner, not to mention how you go about introducing a continuous stream of new equipment onto one. Whilst at FAAM, I finally decided with a bit of encouragement from Springer and several colleagues to knuckle down and finish writing this book, which was started in 2006 at Brunel.

And so, 25+ years of my own experience and study has been brought into this book, along with many centuries of other people’s. In writing it, I have not attempted to produce something that an intelligent layman could use to launch into airworthiness practice without any other knowledge—frankly I don’t think that that is reasonably possible. Like any other aeronautics specialist, my knowledge of airworthiness is built upon a much wider technical education, and I believe that this will always remain essential. Nor have I tried to explain about how to practice in any single environment; since there are too many working environments, civil and military, light and heavy, regulated and deregulated. What I have done however is lay down what I consider to be the main subject areas of initial airworthiness in a way that I hope will be usable by practicing engineers, students, and teachers of the subject. There are topics which might be included, but have simply been omitted through a need to constrain the length and complexity of the book; also many topics are addressed in a depth below that which an experienced practitioner would hopefully be familiar with that specialist topic—but nonetheless I have aimed to achieve a competent overview, and hope that the reader will find it so.

Throughout this book I have attempted to teach by example, and nothing in this is here for the sake of it—every piece of theory has been used, by me, at some point on real-world airworthiness problems.

This book is inevitably based upon the way in which I’ve myself taught and practiced airworthiness, and as such is structured in a way which I hope is reasonably sequential. This is the first such book on initial airworthiness (at-least that I know of) and I’d never claim it’s as good as it could be; so, if any reader would like

to make any recommendations regarding corrections or improvements to this book, I'd be delighted to receive your views via the publisher.

Finally, could I please caution all readers that this book is one man's approach to initial airworthiness, albeit from a fairly wide professional experience. Every organization in the world will have its own approach, which may at-least in detail, contradict what I've written here. Please as a practitioner or student treat this book with healthy caution, and before using what I've written here to challenge any existing practice, do give the issue great thought!

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2014

http://www.springer.com/978-3-319-11408-8

Initial Airworthiness
Determining the Acceptability of New Airborne Systems
Gratton, G.
2015, XV, 319 p. 158 illus., 128 illus. in color.,
Hardcover
ISBN: 978-3-319-11408-8