such as Franklin, Powell and Emami-Naeini (FPE) – *Feedback Control of Dynamic Systems* (the source of several of their chapters). For example, the root locus design chapter of FPE, provides at least 12 worked examples of the design process followed by 48 practise problems for students thereby providing a better learning source for students.

In terms of organisation, it would have also helped if chapters had been grouped together into subsets for clarity e.g. Part A: Dynamics and Astrodynamics, Part B: Classical Controls, Part C: Spacecraft Attitude Control etc. Without these parts, the separation between the chapters is confusing on first glance.

In conclusion, this book covers a broad range of areas – including some more in-depth content (stabilisation techniques, practical design issues) – and is best used as an introductory text to the field for latter year undergraduates.

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Deep Space Propulsion: a Roadmap to Interstellar Flight

K. F. Long

Springer. 2012. 367pp. Illustrated. £31.99. ISBN 978-1-46140606-8.

This is a readable, insightful and personal history of interstellar travel thinking with a focus on propulsion ('the author favours the nuclear pulse', page x).

The history takes us from Aviation to possible solutions that Long hopes will progress us to 'thinking of your own ideas for how machines can be propelled across the vastness of space' (page ix).To help with this aim, each chapter has an 'Introduction' providing a short overview of the chapter while the 'practice exercises' at the end are to stimulate discussion.

The book turns into a politely engaged argument that we as a society should support long term engineering and interstellar projects. The central suggestion is 'The Alpha Centauri Prize...to be held every four years. This would allow sufficient time between design studies so as to allow some technological and scientific discoveries' (page 319). At present, this is a very optimistic timescale for this type of engineering. In fact at least since Project Daedalus, some form of nuclear propulsion has been regarded as the technology needed for interstellar missions while actual technology status has faded away. Long is aware of this and argues for a gradual return to nuclear developments as well as for a Pathfinder 'technology demonstrator mission to 1,000AU (Astronomical Unit), the outermost location of the solar gravitational lensing point'(page 318).

Since at least 1987 Claudio Maccone has made such a mission a priority due to its importance to detect weak radio signals from possible intelligences. The effect is estimated to begin at 550AU but even that distance would be a challenge at present. The Kuiper Belt for example is 'only' at 40 to 100AU. In fact Claudio Maccone in 2009 predicted a focus for gravitational waves and neutrinos at 22,45 to 29,59AU (that is somewhere between the orbits of Uranus and Neptune).This prediction with the increasing instrumentation for neutrino astronomy could perhaps be a mission for the more near term.

Long discusses the gravitational lens mission (page 311) and follows it up with three' Challenger Missions' ie. 150-200AU launched 2015-2020; 200-600AU launched 2025-2030; 1,000AU launched 2030-2040.

However, 'the year 2050 for the first star mission seems quite ambitious. Let us think about a scenario that leads to the first launch by the year 2100' (page 321).This illustrates well the problem with any interstellar flight planning: our present society lacks the intellectual and financial

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preconditions for such missions. To remedy this Long argues for an Institute that 'would attract academics from the word to come together...The interstellar research community awaits the arrival of such investment' (page 309). In fact Long is himself working to provide this since 'we should have had probes in the Kuiper Belt yesterday' (pages 345 and 346).

The theoretical background presented here by Long deserves to be read and the bibliography deserves to be considered as a starting point for anyone interested in these topics. The colour illustrations are very helpful. Introducing this section Long sums up our paradoxical situation: 'it appears we have started from a position of being bounded in the nutshell that is Earth, but yet can count ourselves the Kings of infinite space' (page 326). Further 'this situation needs to change if we are to ever to become a spacefaring civilisation and join the community of worlds that may possibly exist in this vast universe' (page 347).

For such a change we need a change in engineering demand as well as a change in institutions and most of all a change of perception of what is possible. Read this book and discuss.

Anders Hansson

Stimson's Introduction to Airborne Radar – Third edition

G. W. Stimson

SciTech Publishing (an imprint of the IET), Michael Faraday House, Six Hills Way, Stevenage, Herts, SG1 2AY, UK. 2014. 744pp. Illustrated. £110 ISBN 978-1-61353-022-1.

Since its first issue three decades ago Stimson's *Introduction to Airborne Radar* has been indispensable. The second edition was released in 1998, since when there have been major developments in airborne systems, driven by advances in both RF hardware and digital processing. An update was therefore long overdue and at nearly 30% larger this third edition does not disappoint.

The clear style and extensive use of meaningful diagrams remains, augmented throughout with real examples of radar systems and data. Sections are well structured, with key points tabulated for ease of reference. Every section now concludes with key points, short exercises to test understanding and suggestions for further reading. This will be an invaluable addition for students approaching the subject for the first time. For those using the book as a quick reference the main index, a weakness of previous editions, has been greatly expanded and improved. Key radar equations and relations are conveniently printed inside the rear cover.

All sections have been re-edited and refreshed. Important mathematical concepts are now collected together. For hardware; solid state devices, active electronically scanned arrays, receivers and digitisers are all included. For radar processing; existing sections have been expanded, with SAR processing presented in much more detail, including advanced techniques such as tomography and automatic target recognition.

Less traditional radar techniques are covered in depth. All modes of electronic warfare, including use of the array as a passive sensor and for electronic attack are now covered, mindful of the operation of multifunction radars in a congested and contested spectrum.

For radar experts and amateurs there is much here to expand understanding of the very latest concepts and techniques. The authors clearly understand their audience and have produced a work that will quickly become essential to anyone wishing to understand airborne radar.

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