Preface

As the frontiers of technology advance and the work of engineers takes on an increasingly important role in our economy, companies with effective product development and engineering processes will be poised to create value for their shareholders. Those without the will to improve engineering and product development processes will be destined to lag behind.

Our university engineering programs focus on graduating technically sound engineers. Students study the disciplines of Structural Design or Fluid Mechanics. However, in North America, and in Europe, there is little attention paid to teaching the practice of Engineering Management. Engineering programs typically contain a fourth year course on Engineering Economics, where students are taught the mechanics of discounted cash flows and budgets. The courses do not deal with the challenges of managing complex engineering driven companies. With this gap in the training of engineers, it should come as no surprise when a graduate engineer practices engineering for two or three years, and then leaves the profession to take an MBA. Many of these bright young engineers cut all ties to engineering. However, MBA programs are not designed to create Engineering Managers. While the best of them teach the integration of management disciplines to teach general management, the worst provide the engineer with little more than a few specialized tools to apply in the area of Marketing or Finance. Generally speaking the practice of Engineering Management is not taught in our universities. It is not a major area of research and learning, but it is vitally important to the success of today's technically driven enterprises. This problem is being addressed. Courses are being added and enrollment is strong. The research base is lean, but certainly this book will help to fill the void.

The Engineering Manager at all levels has a very complex task. Just as the General Manager must integrate Marketing, Engineering, Operations and Finance, the Engineering Manager has an equally broad, equally complex task. Many engineering departments have specialists who have developed knowledge of a specific element of technical management. However, in today's environment, the management team has to be able to look at problems from a broad, holistic perspective. To be truly successful, Engineering Managers must learn to integrate the concepts of a broad area of technical management disciplines. The Engineering Manager will need to mobilize his organization around this new approach. Only then will the goal of delivering new programs cheaper, faster and with higher quality than ever before be

realizable. In this book the author takes elements from 6 well known and understood bodies of knowledge, and integrates them into a holistic approach for managing engineering. The disciplines of Integrated Product Development, Project Management, Process Management, Systems Engineering, Product Data Management, and Organizational Change Management are usually considered distinct, and often their implementation winds up with disastrous consequences. Never before has one integrated system been proposed to manage your Engineering Department from a holistic standpoint. The approach described in this book will help you develop new products or improve existing ones faster, cheaper and with higher quality than ever before.

We believe that this book will provide you with the breadth of knowledge and the practical tools you will need to lead just such a change. Is this a daunting task? Perhaps, but we will address the changes required, with the same structured approach that we will learn to use to manage your new product development programs. Large problems will be broken down into manageable chunks, and suddenly they will seem very manageable indeed.

The author has been able to put a fine point on the problem after over 10 years as a consultant to large engineering organizations. In his practice, he has worked with the engineers on the CAD system improving a single workstep, all the way to the CEO in the boardroom setting a vision for an entire organization. This has given him a unique perspective on the problem we described above. He knows intimately the individual management tools, but he also knows how to make them fit into a cohesive holistic plan that executives can describe but don't know enough details to implement.

The author has been involved in process management and integrated product development pretty much from its inception. In 1988/89 as a consultant for Ernst & Whinney he facilitated the team that designed and implemented the Integrated Product Development approach at McDonnel Aircraft in St. Louis Missouri. McAir utilized this approach to conduct product improvements on both the Harrier and F18 programs.

In 1991 Ernst & Whinney merged with KPMG Peat Marwick in Canada. And this led to a major business transformation assignment at Boeing deHavilland in Toronto. Bombardier Aerospace acquired deHavilland in 1993. Further assignments were received and they tended to be fundamental improvement projects that were looked upon to deliver step changes in organizational performance. During this time the author left KPMG to found AMGI, the organization of which he is president today. His work at Bombardier led to the creation of the Bombardier Engineering System or BES. Building on the earlier work at McAir, the BES brought integrated cross-functional design teams to a traditional "over the wall" design engineering process. The greatest challenge on the BES was the aspect of managing organizational change within the project. The author fostered a common process across three countries and four cultures. Each company had the pride of their engineering heritage, bolstered by a nationalistic pride that comes from being a "national aerospace company". Today Bombardier has applied the BES successfully on the Global Express and major components of the Lear 45 business jets, and the new Dash 8 – 400 regional commuter aircraft.

The author completed several assignments at the world's major Military Aircraft manufacturers in the period from 1996 to 1999. He assisted in the development and deployment of Integrated Product Development to several military aircraft programs. The concept of concurrent product and process development stuck with him and has helped set the basis of the processes surrounding collaborative projects involving several partners collaborating on a single design.

Being involved with Integrated Product Development from its inception provides a unique perspective. The U.S. Defense industry moved quickly to implement IPD, however with mixed results. Typically they were trying to drive IPD separate from the other dynamics within their organization.

AMGI's focus then became to develop a holistic approach to Engineering Management. Many companies will pick an initiative from one of the common management approaches. They will attempt to implement Integrated Product Development, Project Management Process Management, Systems Engineering, or Product Data Management, often with disastrous consequences as the rest of the organization actively resists the change. However the holistic approach described here is unique. It makes sense. Of course you need new cross-functional processes to support the implementation of cross-functional teams. But, change of this magnitude takes vision and leadership to implement successfully. We believe that this book will provide you with the breadth of knowledge and the practical tools you will need to lead such a change. Top executives in most of the companies that the author has consulted have expressed their neglect of the human issues when deploying IPD or process management.

The approach documented here is a proven winner. It integrates the best thinking in the field of Engineering Management. Over the past ten years we have had tremendous success putting our mark on the engineering processes of such successful engineering enterprises as Lockheed Martin Tactical Aircraft, British Aerospace Military Aircraft, Bombardier Aerospace, McDonnell Douglas, Messier Dowty, as well as many smaller enterprises such as Ontario Store Fixtures.

The aims of this book are to describe a straightforward model for organizing and running an engineering program and to suggest guidelines for selecting and dealing with the most important ingredient in any program, its people, and the collective organizational culture.

With the birth of e-Engineering, many smaller companies are examining their product development processes. The danger is that they will fall into the trap of developing a purely electronic process. We believe that the approach we outline in this book is a prerequisite for making the move to electronic, collaborative projects. The book does not dwell on technology. Instead, it deals with people, politics, processes and management. No technological solution will succeed if it does not consider the impact on people. Electronic file sharing is useless if no one knows who has the authority to approve a drawing, or worse yet if the previous signatory is upset that a "team" now triggers the sign off. These are the issues we deal with in this book. Software teams will get the electronic system up and running. Only a leader with a broad vision can make it work.