**BAE Systems, Inc.**

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**Concepts of Systems Engineering (SYS501)**

**Core Competencies and Requirements for Success**

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**INTRODUCTION**

Systems Engineering has many different definitions across industries and throughout the world of engineering as it stands today. Broadly, Systems Engineering (SE) is an interdisciplinary approach and a means to enable the successful realization of complex systems. A system can be defined as a set of interrelated components working together towards a common objective, and showing this definition enables the discussion of the core competencies and requirements for a Systems Engineer (SEng).

In order to facilitate this discussion towards a relevant example, the following scenario will be used. As the Chief Engineer on a program, the task is to create a passenger aircraft. It is the responsibility of this Chief Engineer (CE) to define the skills and competencies of a SEng to staff the program and position the program for success.

**ASSUMPTIONS**

A few assumptions will be made for this scenario. The SEng will have worked at BAE Systems for 2-5 years and has been supporting engineering for this time. They have an engineering-related Bachelors degree and possibly a Masters degree in their discipline only. They have not assumed a role of a SEng previously to the start of this new program. They have flown on passenger jets prior to the staffing of this program. The core competencies and requirements for a SEng will be defined for a CE staffing a program in the initial Design Phase of the Systems Engineering Life Cycle.

**CORE COMPTENECIES AND REQUIREMENTS**

The goal of the task at hand it to design a passenger jet. This is a large and complex problem with many components working together, designed separately, and tested as a whole. Given the nature and scope of the project, it may very well be the case that multiple contractors will be needed to analyze the problem space. The first requirement for a SEng is to have solid communication skills – written and orally. The SEng on a large program will constantly interface with many people, such as the customer, design engineers, cost and scheduling experts, program managers, and production experts (just to name a few). Documents, presentations, and reports are the vehicles a SEng uses to communicate internally and externally – being a strong writer and communicator of thoughts is crucial to the success of the program as a whole.

In order to assume this role, they must have some interdisciplinary technical engineering knowledge – having been exposed to electronics, hardware, and software. Even though a deep knowledge of these areas isn’t necessary, a working knowledge of how design engineers build to specifications should be evident and expected. Experience in data analysis using MATLAB is needed, as this tool is heavily used throughout BAE Systems to model simulation environments early in the Design Phase.

A general base of engineering knowledge should be the foundation on which other skills have been built upon. A SEng should have some experience with cost and scheduling management. It is necessary to be able to define smaller tasks which roll into bigger tasks and accurately compute the earned value on a program in regards to schedule and spending. After all, systems engineering helps guide the planning of a program and everything engineers do is linked to cost. The SEng on the program will need some business sense in order to perform the tasks. BAE Systems take on a certain amount of risk with each program, in order to propel themselves into new markets and grow the business, and understanding the reasoning for the actions at the Executive Level is important. Risk is a component which a SEng is managing continuously throughout the life of the program. This candidate engineer should be able to document, analyze, and assess risk through the help of design engineers, program managers, and the customers themselves.

One final and vital core competency is the ability to be a “big picture” thinker. Even though this candidate engineer has been supporting a traditional function like ME, EE, or SW, a thirst for understanding how the components they have been designing, coding, or analyzing fit into the system has to be present. This mindset, coupled with strong organizational skills, the ability to prioritize tasks in real time, and a positive attitude will take a SEng far.

**PERONSAL EVALUATION**

My personal evaluation against these core requirements are presented in the table below. A self-perception on whether I am in compliance with these skills can be visually seen through a 3 color scale in the 2nd column of this table – Green, Yellow, and Red. The 3rd column provides my own personal evaluation regarding the justification for having chosen the compliance ratings.

| **Core Competency** | **Compliance [R/Y/G]** | **Personal Evaluation** |
| --- | --- | --- |
| **Communication Skills** | G | I have always felt I excel with communication. Interacting with people is one of the reasons why I’ve chosen the SE path for the future. I take communication very seriously, and given that I'm both leading a team of individuals right now at work and am reporting to multiple folks across my organization, good communication is crucial to my every day work. |
| **Written and Oral Communication** | Y | My writing is always in a state of improvement and I have a plan to keep working on this for the coming years. I’ll keep this Yellow instead of Green because written skills can always be improved, and need to be altered in real-time depending on the situation at hand and the audience (e.g. customer/internal). |
| **Interdisciplinary Engineering Knowledge** | G | As a member of the Engineering Leadership Development Program at BAE Systems I have had a 9 month, inter-disciplinary domain training where I learn about many topics related to the core technology of BAE Systems in the Nashua Area. This experience has rounded my education in signal processing, optics, electronic warfare, and mechanical analysis – which are topics that are outside my subject matter expertise. Rotating within my current business area has also helped me interface with all types of engineers, and has proven extremely helpful in my current job rotation. |
| **Cost and Scheduling Expertise** | Y | I am currently responsible for the schedule of my program, from my own team's perspective and for the customer. I have had no experience with the cost associated, but plan to learn the inner workings of BAE Systems WBS (Work Breakdown Structures) in the very near future. |
| **Business Development Expertise** | R | I have yet to experience full company Business Development, including the capture process and all upfront competitive analysis that needs to be done in order to address Requests for Proposals (RFP). |
| **Risk** | Y | I have had a good deal of risk management experience on my current program, but only from a schedule perspective. Positive outcome of the choices I've made to date will help foster trust with program management, which will give me experience in risk mitigation and management. |
| **Big Picture Thinker** | G | The scope of my current program and the interdependencies which currently exist ask me to ALWAYS be thinking ahead into the future. An example of a question I constantly ask myself is: "How will this software implementation or requirements change affect our future software baselines?" |
| **Organization Skill / State of Mind** | G | I consider myself a very organized person. It's important to be able to organize thoughts and convey messages. Being positive even when things may not be is a value skill that I work hard to perfect every day, especially when I have a team of 6 individuals looking to me for tasking each and every day. |