Aviation, Space & Defense Division Newsletter

FEBRUARY 2021

IN THIS ISSUE

Featured Articles

From the Chair | Philip Montag

ASD Chair Message February 2021

Hello and welcome to 2021! I hope everyone was able to be safe and participate in holiday events with friends and family. Your ASD Division leadership team has been meeting on a monthly basis to understand and adjust to the changing and challenging work environments we have all been adapting to. As of December 2020, our membership stands at 6,538, up 273 from July 2020. To note, our prior 12-month running membership count was 4,365. Thanks to our VOC chair, Roger Merriman, a voice-of-the-customer survey was released on ASQ. We ask our members to respond so we can make sure to incorporate your feedback into our future business plans. The link is on MyASQ. In closing, I sincerely hope all of you and your friends and families are doing well during these times. Please stay safe and aware, and I look forward to seeing you at WCQI in 2022!

Philip Montag

Division Leadership

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CQSDI 2021 Update

by Philip Montag

Hello everyone. Mark your calendars for the free, virtual CQSDI 2021 on March 9-10, 2021! The planning committee was striving toward a two-day face-to-face event as we have done in the past; however, given the current state of COVID, we decided to hold a virtual session with the most relevant content slated for the face-to-face event. The 2021 Virtual CQSDI is scheduled for Tuesday and Wednesday, March 9-10, 2021, including sessions from 10 a.m. to 12:15 p.m. EST. Each session will be kicked off by high-level industry and government speakers followed by panel discussions showcasing remote technology-enabled quality assurance success stories and the cybersecurity aspects that are required for implementation of remote technologies.

Tuesday's panel will focus on new technologies related to/required to perform things virtually (audits, inspections, processes, automation, flexibility in manufacturing, adaptability). Specifically, Panel 1 currently consists of subject matter experts from the Jet Propulsion Laboratory (JPL), Raytheon, Honeywell Process Solutions, and DCMA. This panel will present and discuss innovative solutions for remote presence, manufacturing, field service, warehouse solutions, mentoring, training, auditing, and inspections across multiple industries using various IT platforms and technologies. You will hear about success stories across a variety of platforms and industries, lessons learned, and deployment recommendations.

Wednesday's panel is on information cybersecurity challenges related to virtual inspection methodologies and operations, and includes panelists from Raytheon, Northrop Grumman, and Ball Aerospace. Systems engineering has traditionally defined system requirements and verification methods/events to ensure system compliance upon delivery. Verification methods have typically included in-presence inspection, analysis, demonstration, and test. Inspection, in particular, required inspection of physical hardware and components, source code inspection, and review of data-sheet specifications or drawings. Many of these historical operational methods are proving to be obsolete due to the necessity for remote operations. However, tools for remote operations can fall prey to cybersecurity concerns and challenges. This panel will address these challenges and explore options for product compliance verification using new virtual inspection techniques and practices. Specific examples to be discussed include the inspection of hardware, technical data packages, and performing supplier source inspections.

AI Analytics to Offer Real-Time Remote Control of Production and Supply Chain Management to the Aerospace Industry

by Tsahi Petel and Gideon Roth

The aerospace and defense industry is facing major challenges in today's market environment due to the integration of supplier data and internal manufacturing data to improve efficiency and quality control. Most analytics solutions developed in the past were only designed for mass production industries and would not work for the low volume of the aerospace industry.

The aerospace industry is now embracing manufacturing analytics solutions from the fourth industrial revolution powered by artificial intelligence (AI) technology. Various aspects of designing, testing, and building aircraft parts of the aerospace industry can be integrated in an analytics advanced solution to impact production in the sector.

Integrating data and knowledge generated from aerospace manufacturing activities requires understanding which of Industry 4.0's capabilities can achieve the full potential from data. As the industry still deals with manual quality management, including spreadsheets and modules from enterprise resource planning (ERP) vendors, integrating all the manual data with the automated data is one the challengers.

Aerospace quality systems require a holistic approach that combines data from the supply chain

A complete overview of the aerospace manufacturing data needed for successful operational management is hard to achieve, as we deal with endless formats and structures of data from all types of internal machines, equipment, and manufacturing systems along the supply chain.

Real-time remote control of production and supply chain management requires an integrated manufacturing database.

Data harmonization is an important aspect of any advanced analytics implementation and refers to all efforts to combine data from different sources.

Using AI with any data structure when managing for quality for the aerospace industry

At any aerospace factory, or at suppliers' factories, there are a variety of data sources and structures, and the challenge is to get them synchronized to develop a well-managed analytics system that ensures quality assurance. AI technology offers the possibility of a comprehensive diagnostics system that combines data from each stage of production into a unified format.

Technology - Fast and scalable data integration divided into two stages:

1. Integration (one time)

2. Continuous usage

The automated data integration technology powered by AI is able to integrate, interpret, and analyze any manufacturing data located on any global source for all production lines (testing stations, machines, sensors, ERPs, manufacturing execution systems) to improve aerospace industrial monitoring and ensure the required quality level.

The development of a data integration system that combines AI and machine learning technology for the aerospace industry will automatically analyze all captured data using advanced algorithms and create advanced analytics. The interactive manufacturing analytics dashboard can be accessed by managers from different devices, including automatic anomaly detection and alerts.

In such a process, the manufacturer's managers will receive a broader range of all their production line issues, enabling them to produce better quality parts at a reduced cost and prevent recall incidents.

Planning which manufacturing quality data to include in BI analytics

Manual labor is increasingly automated, along with data integration, which becomes a centralized system. When these systems become automated, as inline quality analysis technology, manufacturing quality data will improve.

The first step is to integrate and unify all the global quality data sources into one harmonized database, even from third-party vendors like contract manufacturers. When manufacturing errors happen, you need to be able to determine the root cause of the error very quickly and then correct it. This is only achieved when you have the data available with your analytics.

Once all data processes are unified in one database, BI analytics and data analysis will be most effective.

Data from every phase inform the quality of the line and the progress of the project, so it is crucial that they are not overlooked at any point when working to manage quality data for the aerospace and defense industry. The gathered data can also be used for improvement of products and processes by providing data from across all production lines and supply chains. Engineers and developers can use lessons learned and the online feedback to improve current and future designs.

Biographies

Tsahi Petel is vice president of Client Solutions of QualityLine. He has senior management experience and more than 20 years of expertise in general management and business development.

Gideon Roth is an ASQ Fellow, ASQ BOD 2019-20,ASD International Liaison, Juran medal committee chair, and GRC Consulting owner.

Remote or Not Remote? Choosing the Right Supplier Audit Method – Remote, Hybrid, or On-Site

by Alon Schonberger

Supplier audits have a high impact on incoming quality, which is a core requirement in the supply chain of leading companies. When carried out effectively, the audit creates value and benefit for both parties – the customer and the supplier. The first-time audit serves for learning the requirements, acknowledging the risks, and coordinating mutual expectations. Further audits serve to control and initiate improvement activities.

According to the classic protocol, the execution phase of the supplier audit – interviewing and obtaining objective evidence – must be conducted at the supplier's site. Yet, recent evolutions in communication technology have introduced the remote audit – an audit that is conducted off-site, without physical presence at the audited premises. This evolution is reflected, for example, in ISO 19011 standard – *Guidelines for auditing management systems*, which includes in its 2018 edition references not only to on-site audits but to remote audits as well.

Despite this evolution, most audits performed prior to the COVID-19 outbreak in early 2020 were on-site ones. However, this totally changed when the new virus appeared and redefined the "rules of the game." To restrain the pandemic spread, governments and states all over the world have taken severe measures, like closing borders, canceling flights, and posing social distancing, leaving in many cases the remote audit as the only practical option. Looking forward, we need to adjust ourselves to the present era and to the day after as well, including reconsidering of the way we conduct audits.

The purpose of the current study was to explore the off-site supplier audit, confront it with the on-site one, and provide means for choosing the best option in each particular case. Accordingly, we have taken advantage of the following research methods:

1. Conducted a survey. Questionnaires based on Google forms were conveyed to auditees and auditors. The participants were asked about experience, infrastructure, coverage, feasibility, bias, logistics, risks, and preferences. One hundred fifty-three completed forms were received and analyzed. One of the salient conclusions exhibited is that roughly 50% of the respondents put forward that remote audits should be applied for inspection of documents only.

2. Examined a database comprising 264 on-site audit reports. Some 2,213 findings concerning first-time certification, recertification, and all the technological disciplines, stemming from these reports, were analyzed. Following interviews with auditors and auditees, and based on our own experience, we identified a group of substantial findings that were highly likely to being overlooked by remote audits. We then reviewed all the database findings and compared them to the first group. We concluded that 20% of the findings were likely to be missed by remote audits.

3. Conducted designed experiments. Eight audits, each referring to 10 chosen topics, were conducted in a simulative environment, testing the sensitivity of on-site and off-site audits to two factors: supplier's outsmarting and auditor's optimism. We conclude that remote audits are more sensitive with respect to these factors.

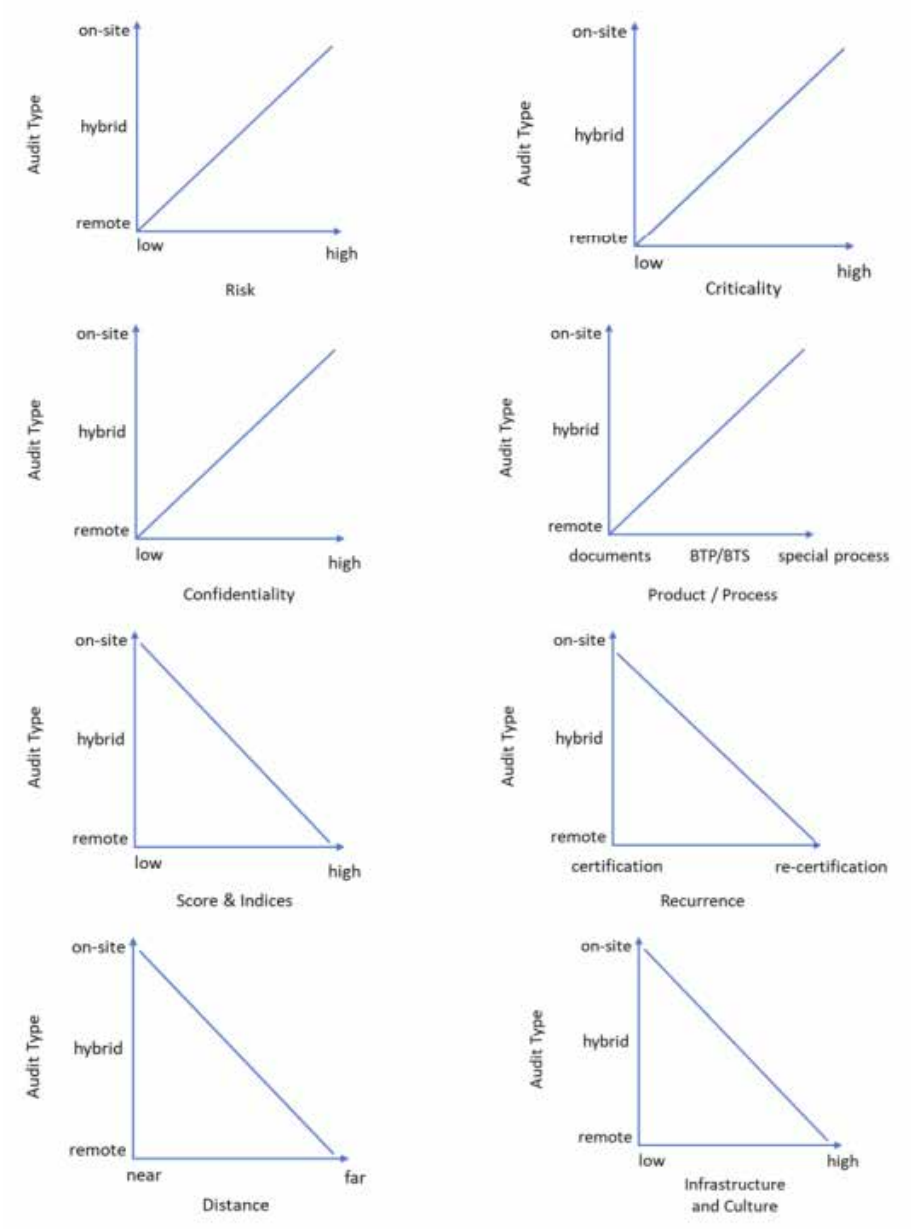

Figure 1: Considerations for choosing the best audit method

The process of decision making comprises two phases: understanding the contribution of each factor, and integrating them with the allocated resources and the external constraints. **Figure 1** presents the relation between the different factors and the preferred audit methods, as increasing or decreasing functions.

The decision-supporting tool integrates all the relevant considerations with the allocated resources and the external constraints, and is presented in Figures 2 and 3. It receives as an input the answers to designated questions (up to 22) and provides as an output the best audit method. The calculation behind the scenes is based on direct scoring for positive questions, complementary scoring for negative questions, and strong gravitation toward on-site audits when first-time certification or special processes are involved.

For the cases in which remote audits are recommended, we provide a full protocol, including references to common obstacles and pitfalls, and solutions for overcoming them.

One final remark – it is not inevitable that future technological and cultural evolutions will change the way we conduct audits.

Biography

Alon Schonberger holds bachelor's and master's degrees in mechanical engineering, from the Technion, Haifa, Israel. He is an ASQ Certified as a Quality Engineer (CQE) and holds an MBA from The Open University, Ra'anana, Israel. He has 30 years of experience in research, design, engineering, production, and quality. He also works as a part-time lecturer at some academic colleges.

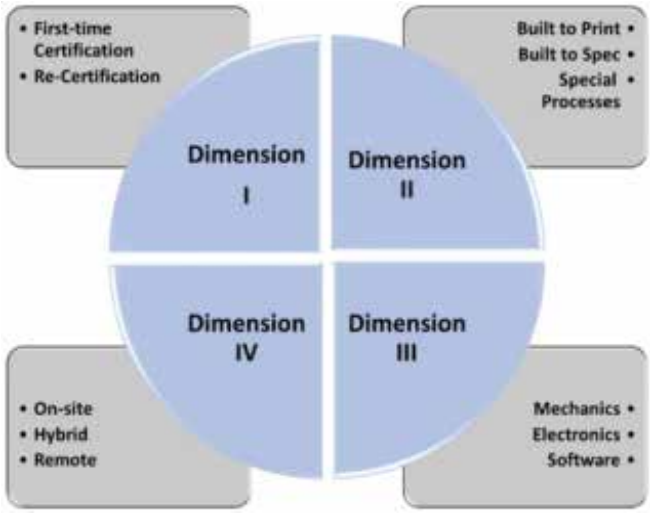

Figure 2: Dimensions of supplier audits

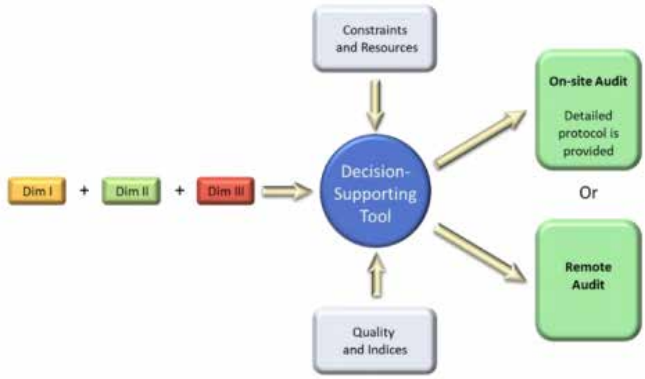

Figure 3: Decision-supporting tool, based on the risk assessment methodology

Zero Defects: No Matter the Market, the Formula Remains the Same

by Christopher Vest

The aerospace industry is at a critical point in its journey, with production rates and expectations for premier performance at an all-time high. Recent major programs entering service have not met customer performance expectations, causing increased maintenance inspections, limited utilization, retrofits, and flight cancellations. The automotive industry went through this transformation in performance decades ago, and major aerospace customers are expecting the same transformation to occur. This expectation allows you as a quality professional to differentiate your business.

Quality is often underutilized as a way to differentiate businesses from competitors and provide a premier customer experience. One way a business can use quality as a differentiator is through the robust application of advanced product quality planning (APQP). The application of the traditional tools of APQP can be accomplished under any market condition or business maturity. The goal of APQP is and always has been zero defects.

To provide customers with zero defects, a business can utilize a seven-element approach that addresses common areas for escapes and concessions. The focus areas are: augmenting product and process monitoring and control; a preventive mindset to identify and mitigate risks, validate changes to eliminate unintended consequences, and engage all levels of supply chain in escape prevention; and robust designs that embrace error proofing and process capability.

The approach to zero defects can be tailored based on your place in the market, the condition of the market, and the resource conditions within your business. There is no defined set of plays that will work for everyone, but I will provide an example on how a business can utilize its resources to achieve the goal of "engaging all levels of supply chain."

Example: Medium-sized assembly and test business with yearly sales at $50M. One supplier quality engineer to manage 50 suppliers mainly located within a 300-mile radius.

Setting a plan: The approach should be tailored around the top 20% of suppliers first (sales dollars, pieces shipped, etc.). Your key leadership counterparts must be fully engaged and bought in on achieving zero defects. Everyone from the general manager to the supply chain have to understand the benefits of zero defects and be willing to support this initiative.

My recommendation would be to focus first on your supplier quality resource and ensure this individual has a full grasp of the concepts of APQP. He or she needs to be a strong facilitator for things like process failure mode effects analysis (PFMEA) and control plans, but also a technical expert in capability analysis and assisting in setting up statistical process control.

Next, engage with the top leader of your suppliers (owners, presidents, general managers, etc.). They need to understand your goals of this approach and that this is not something you are doing to them. Rather, you partner with them for the success of both organizations. You will find that not all your suppliers are willing to think in this mindset. A decision will need to be made if they are going to help get you where you want to go.

The next challenge will be the limited resources you have to engage with suppliers. Given the relatively local supply chain, I recommend a face-to-face visit to bring an overall awareness to your approach. Establishing known training experts who can be provided to suppliers as an additional resource will be beneficial and reduce the burden on your resource. As suppliers begin to engage with the tools, they will have questions. Setting up virtual office hours, where your supplier quality resource can be available via any of the virtual

meeting platforms, is going to allow your resource to manage time appropriately and not be getting 25 calls a day with questions on the application of the tools.

Since everyone's definition of "good" is different, setting up an assessment of the "goodness" with respect to the application of the tools is going to be necessary. This will allow the suppliers and your business to understand how well the suppliers are doing. This assessment can be done as results driven (COPQ, FPY, Escapes) or how well they applied the intent of the tools.

Figure 1: ZDP Framework

As you can see in **Figure 1**, the application of APQP with the goal of zero defects can be complex yet simple. The example was focused around a business mainly performing assembly and test, but the same principles can be applied to business focused around any facet of manufacturing.

Everyone in the business will play a role in achieving zero defects. Whether it is a simple improvement idea escalated to a supervisor or a strategic deployment initiative undertaken by the leadership team, APQP is a simple set of tools that work when executed properly. But remember, this is not a one-time initiative; it is a cultural transformation and will require several "do loops" to get it right. Just when you think you have it right, something will pop up and cause you to go right back to a DFMEA, PFMEA, or control plan to make adjustments.

Biography

Christoper Vest is Division Quality Manager, Interim Division Lean & EHS Manager, Gas Turbine Fuel Systems Group, Parker Hannifin Aerospace Group.

Message from the Editor

by Marie Lawton

We hope you enjoy the current edition of the ASQ Aviation, Space and Defense newsletter. We are happy to introduce you to some of the latest thought leaders in the arena of quality! As I put the latest issue together and review the content, it strikes me how much we have adapted to the environment around us. Remote auditing and remote meetings are routine to us now, when almost a year ago we could not conceive of how to do business during a health crisis such as we find ourselves in today. Yet here we are, and we have adapted and transformed how we work.

When I was at RIT working on my degree, we touched on transformational change and how as the years roll on, the cycle of change will get ever more rapid as technology, processes, and people change. We are in an extreme rapid cycle of change, and we have proven that we are resilient and adaptable. This is the new business model; we can drive change and be effective, we can succeed in our structure of management, and even with the impact to the company culture, we can find a positive outcome.

Thank you to our loyal ASQ ASD Division members, and my thanks and gratitude go out to the respected authors in this edition. If you would like to contribute an article to appear in the next edition of our newsletter, please feel free to contact me at Mxr5970@gmail.com. Stay safe and we hope to see you at the CQSDI in March.

A Brief History of the Aviation/Space and Defense Division

Since 1954, the Aviation/Space and Defense Division has been devoted to quality-related activities as they involve the aviation, space and defense industries.

Among the areas of involvement, the most significant contributions have occurred at the Secretary of Defense level regarding government standards, specifically MIL-Q-9858 and MIL-I-45208. Accordingly, the Division has influenced the interpretation and implementation of basic specifications. Beginning in the 1960s, the Division originated and sponsored DCAS forums that served to educate and update industry on quality policies and new developments within the DoD.

In the 1980s, the Division began to organize major conferences addressing commercial aviation, space, defense and international maintenance issues: the Conference on Quality in Commercial Aviation (CQCA), the Conference on Quality in the Space and Defense Industries (CQSDI), and the International Maintenance Symposium (IMS). The IMS was merged with the CQCA in 1999. All of these meetings bring together an international audience and involve key leaders from such organizations as the FAA, other civil air authorities, the armed forces, NASA, and several international space agencies.