

MHUB

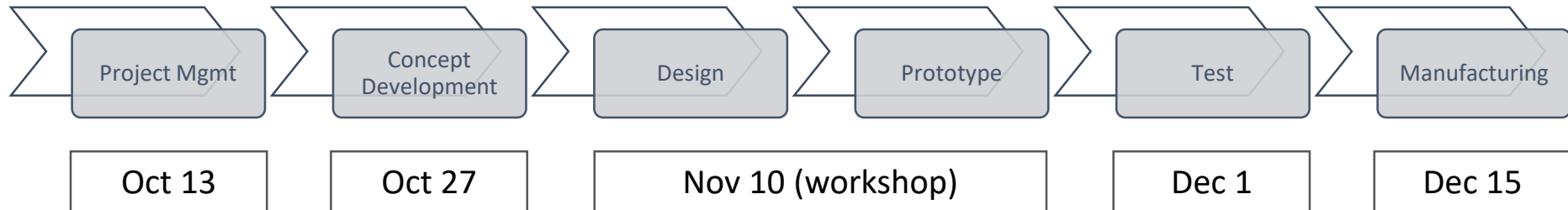
Preparing for Production Launch
September 28, 2018

Jim Shaw (Fastway Engineering)
Mike Rafferty (Rafferty Engineering)
Kapil Kalokhe (Aloo)
Tom Judge (GJ Motorsports)

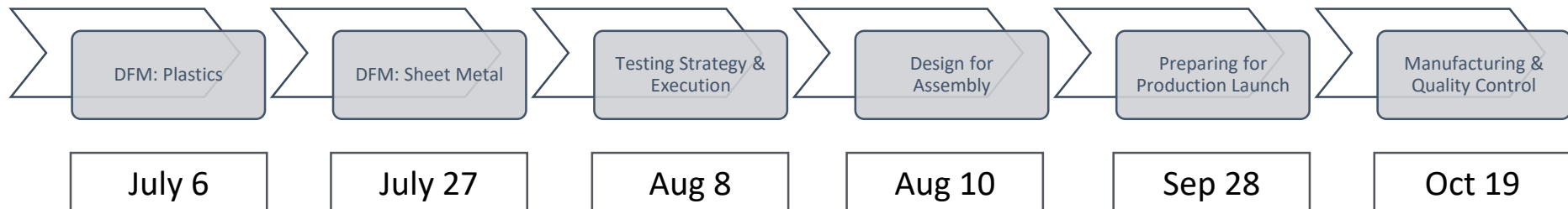


mHUB Programming: Product Development

► 2017 Introductory Classes:



► 2018 Advanced/Deeper Dive Classes:





Preparing for Production Launch



Today's Agenda

- ▶ Example Production Checklist
- ▶ mHUB Member Experiences:
 - ▶ Mike Rafferty (Rafferty Engineering)
 - ▶ Kapil Kalokhe (Aloo)
 - ▶ Tom Judge (GJ Motorsports)



Preparing for Production Launch

- ▶ High Level Pre-Production Checklist for Hardware Manufacturing
 - ▶ Product/Customer Requirements
 - ▶ Aesthetics (Design), Performance, Durability, Quality, Software Functionality/User Interface.
 - ▶ Bill of Materials (BOM)
 - ▶ Nested subassemblies down to the lowest level nut/bolt. Include costs, materials, quantities, bulk items (adhesive, lubricant), purchased items, shipping materials. Have an idea of lead times – What is the longest lead time item in the BOM?
 - ▶ Engineering Specifications
 - ▶ 2D Drawings for every part & assembly with tolerances & installation notes; 3D CAD models of hardware, and 2D Gerber Files for PCB's. Make sure the Intellectual Property is protected if applicable.
 - ▶ Prototypes
 - ▶ Various: Looks like, feels like, works like. Have ready the closest thing possible to production-ready.
 - ▶ Order Quantities
 - ▶ Be prepared to quote for multiple “batch quantities” to get idea of production efficiency steps.
 - ▶ Materials & processes
 - ▶ Do homework on the processes and materials being used. Don't let the CM be the only expert at the table. Maximize your credibility during negotiations! Will special tooling need to be designed for the product to be made? If so, who designs it, pays for it, and owns it?
 - ▶ Quality Control
 - ▶ Establish which aspects of the product are critical, and determine a process for how the CM is going to measure it and communicate it to you. Do homework on Statistical process Control & 6 Sigma concepts. How many will be built for the “pilot run” and who will conduct the first article inspection, and what happens if there is a non conformance.
 - ▶ Distribution & logistics
 - ▶ How is the product going to get from the manufacturer to the customer? Who is holding the inventory? Is there a shelf life? How will the product be protected through storage & shipping? When do you have to pay for the product and under what terms?
 - ▶ Technical Support
 - ▶ What happens when the customer has a question? Who will answer it? How will Returns be managed? Will you need a Field Service programs? How will Tech Support be educated by the technical team?
 - ▶ Change/Configuration Management
 - ▶ What if an engineering change is made after production starts? How will the change be documented & communicated? What will the disposition be on products in process, or raw materials already purchased? Will customers need to be notified?
 - ▶ Risk Assessment
 - ▶ Ask yourself “what could possible go wrong?” and write down an action plan in case it occurs. Always have a Plan B.
- ▶ Additional Resources” <https://www.dragoninnovation.com/resources>



Preparing for Production Launch

- ▶ Mike Rafferty (Rafferty Engineering; 30 years product development experience, mostly in mechanical engineering competencies)
- ▶ KVGear Vixen Mixer
 - ▶ Small handheld music mixer with dense electronics
 - ▶ Market (niche hobbyist) was proven, form factor was smaller than others
 - ▶ Thru-hole vs SMT components: technology didn't match the machinery at mHUB, so needed to be resourceful
 - ▶ Longer than expected testing, electronic troubleshooting
 - ▶ Ultimately launched later than expected (Kickstarter)
 - ▶ Electrical development ended up being 3X planned budget
 - ▶ “know when to give up and get outside help”
 - ▶ Contract Manufacturer – Don't expect them to troubleshoot design issues
 - ▶ Get the core competency “in-house”
 - ▶ For electronics, the prototyping process is definitely NOT the same as the manufacturing process, and some components which were chosen for prototyping were not okay for the manufacturing machines (which put the PCB under higher than expected temperatures for soldering)



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▶ Kapil Kalokhe (Aloo)

- ▶ Team Experience: Kapil (Biz/Marketing) & Partner (Mom/Dr.)
- ▶ Quoted multiple CM's with wide range of capabilities and multiple approaches
- ▶ “Not all CM's are created equal; not all quotes are apples to apples
- ▶ Plan for 3X the original timing/schedule (with startups, 1 hr = 3hrs!)
- ▶ You MUST visit the Contract Manufacturer facility
- ▶ Learned from early mistakes to effectively negotiate with partners down the line
- ▶ “Startups need to sell a CM like they are selling a financier”
- ▶ Plan for tooling costs increases and changes need to be made late in the game
- ▶ No such thing as Over communicating with your CM
- ▶ Kickstarter experience helped us with pricing for the market
- ▶ Don't forget: List price includes shipping and packaging!!



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▶ Tom Judge (GJ Motorsports)

- ▶ Self –funded pre-sale of automotive aftermarket brake light (user installed)
- ▶ Relatively low production volumes, so machine shops all “no quoted” the job
- ▶ “Build more than you need!”
- ▶ Understand the machine capability and mechanical tolerances
- ▶ “Build in a margin buffer if possible!”
- ▶ Electronic cable assemblies proved to be very expensive, so redesign for modular/common design across product lines proved very valuable
- ▶ Don’t forget to include overhead and operating costs!
- ▶ This experience (difficulty in finding a machine shop partner) prompted an investigation to look for a machine to purchase. In this case, bringing the capability in house makes business sense.
- ▶ Entrepreneurs should always keep an eye out for opportunity like this – but need to fully understand the capital requirements (\$\$\$).



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Thank You!

1. Next Class – Manufacturing & Quality Control: October 19
2. Please Remember: Sign-in Sheet & Class Survey