

# Guidelines for Formulating and Writing Process Control Documents and Process Specifications for Advanced Materials

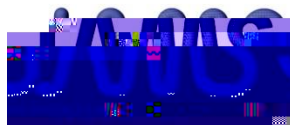
John Tomblin, Wichita State University

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Royal Lovingfoss, Wichita State University

JAMS 2019 Technical Review

May 22 - 23, 2019



# Overall Program Information

**Technical Monitor:** Ahmet Oztekin

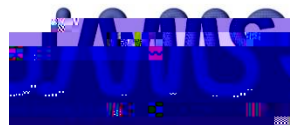
**FAA Sponsor:** Cindy Ashforth

**NIAR Contacts:** John Tomblin, Royal Lovingfoss, Rachael Andrulonis

**Industry Partners:** Toray (Tencate), Solvay, Spirit, Fiber Dynamics, Boeing, Stratasyss, Axiom, GE, Teijin (Toho Tenax), Rolls Royce, and Meggitt

## Overall Goal

Primary goal:



# Overall Technical Approach

Understand the hierarchy of PCD, Quality Manual, Material Specification, and Process Specification.

Work with industry partners to understand their input.



PCD (Process Control Document)



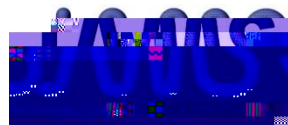
Quality Manual



Material Specification

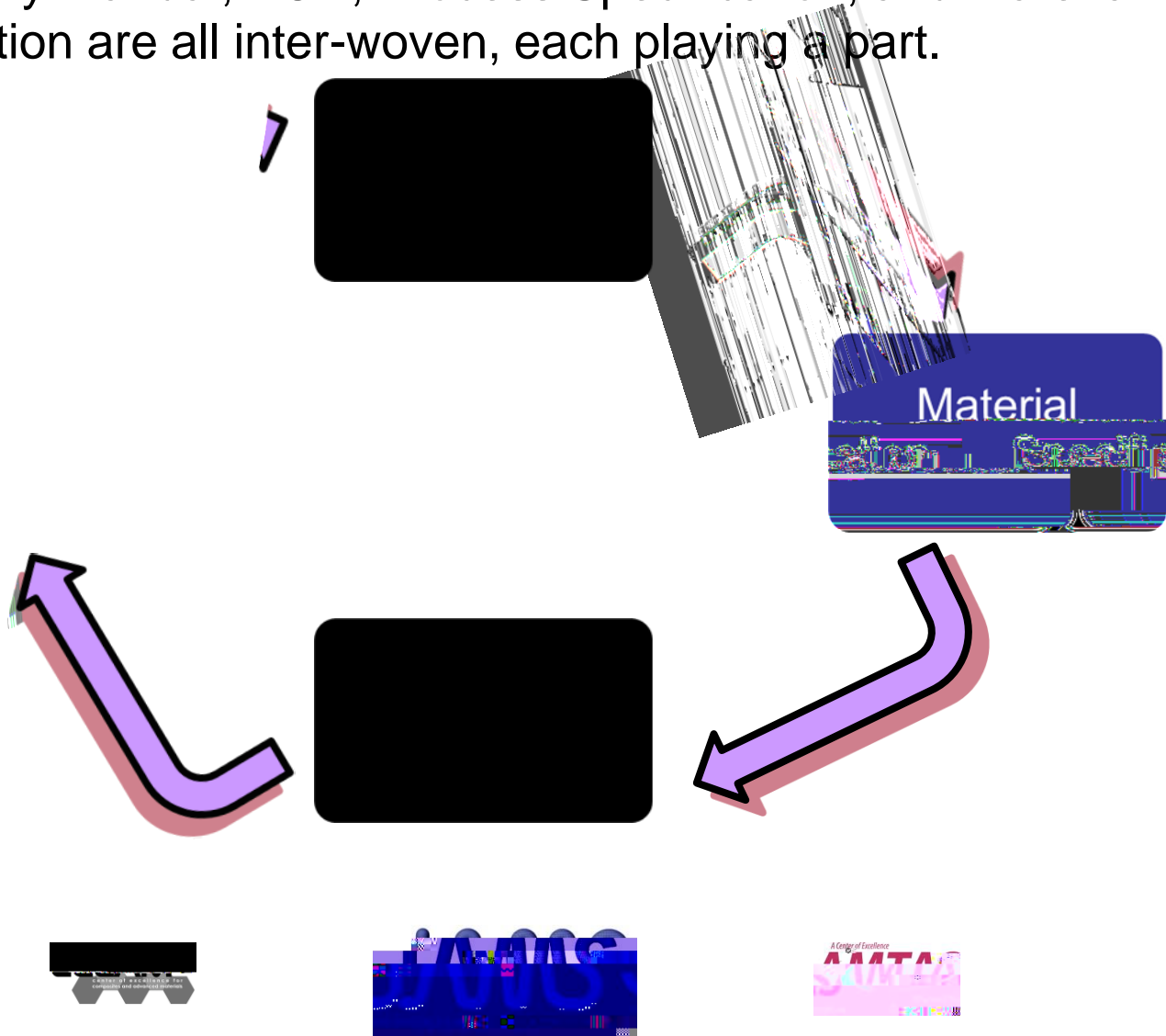


Process Specification



# Technical Approach Outcome

The Quality Manual, PCD, Process Specification, and Material Specification are all inter-woven, each playing a part.



# Technical Approach - Objectives



WICHITA STATE  
UNIVERSITY  
NATIONAL INSTITUTE  
FOR AVIATION RESEARCH

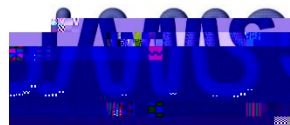
Recommended content for a process specification.

Understanding which sections will include information from the PCD, Material Specification, and Quality Manual.

Similarities and differences of processes for different material types.

The flow of the process document.

Work with industry partners to understand their input.



# Task 1: Process Specification Sections and Flow

Introductory Information - Title Page, Revision History, Table of Contents, Introduction, Acronyms/Definitions, and Reference Documents.

Raw Materials how to procure, store, inventory, material specification, and deal with non-conforming products.

Product Manufacturing Raw Materials, Environmental Conditions, Machine Settings (temperature, time, pressure, vacuum, feed rate, speed, etc.), Tools, Post-Processing Techniques (bonding, surface prep, paint, lightning strike, etc.), In-Process Testing, Non-conforming Product, Personnel Training.

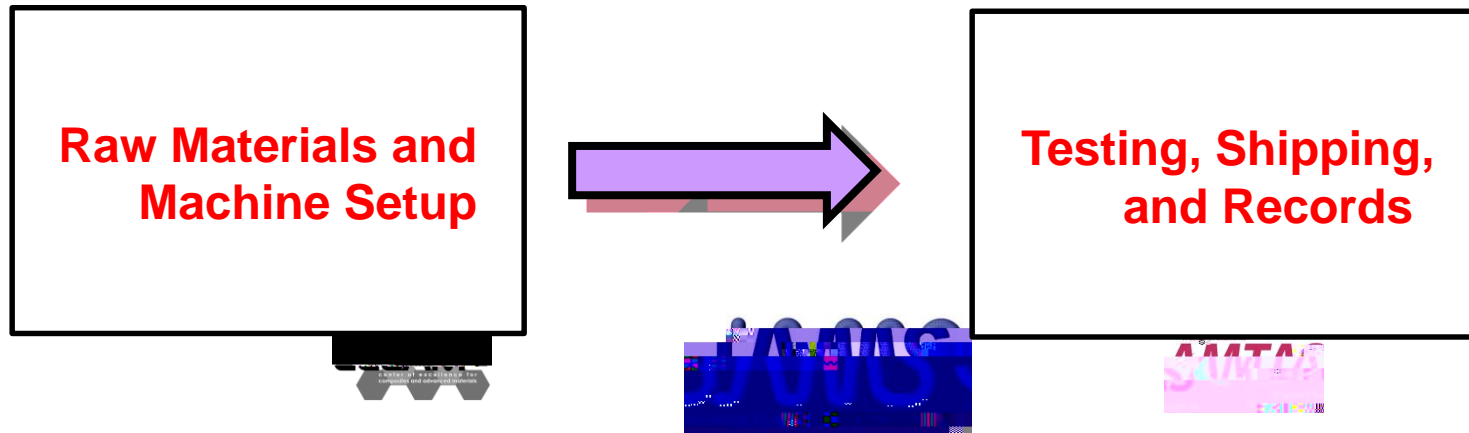
Finished Product Packaging Package Type, Measure Type, Labeling, Package Orientation, Shipping Documents.

Storage of Finished Product Environmental Conditions and Storage Life.

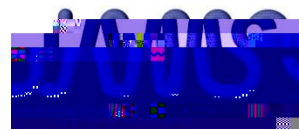
Testing of Final Product Which tests, How many replicates, Data storage, CoCs, Retains.

Shipping of Final Product Special Instructions, Environmental Conditions, Inventory release.

Record Retention Which records must be kept and for how long.



# Task 2: Incorporating Industry Feedback

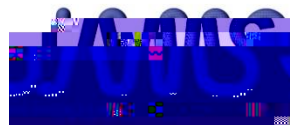




**General Guidelines** An outline that includes information that should be included for any material system.

**Specific Guidelines** Additional information by material type:

Thermoset Polymer Matrix Composites (PMC) Prepreg



## General Outline

Completed

Will have final review once the rest of the document is complete.

## Current Activity

Third review is occurring now for all material types except Adhesives.

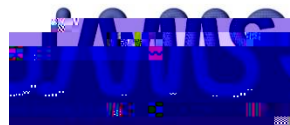
Adhesives section is in progress, ECD of June 14, 2019

## Future Activity

Complete the Adhesives Outline.

Update all outlines per review feedback.

ECD of July 31, 2019





## Additional Material Outlines

Add material outlines to the document as needed.

Core

Metallic Additively Manufactured Materials

Combination of Advanced Materials

Materials not yet known

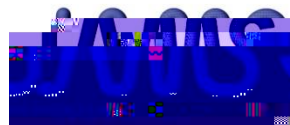
Continue to revise as new advancements are made

Heat treatment methods

Fiber placement methods

New bonding processes/surface treatments

?



# Questions or Comments?

# Thank You!

