Composite Structure Engineering Safety Awareness Course

Roles and Responsibilities

- OEM
- Material Suppliers
- Part Suppliers
- FAA

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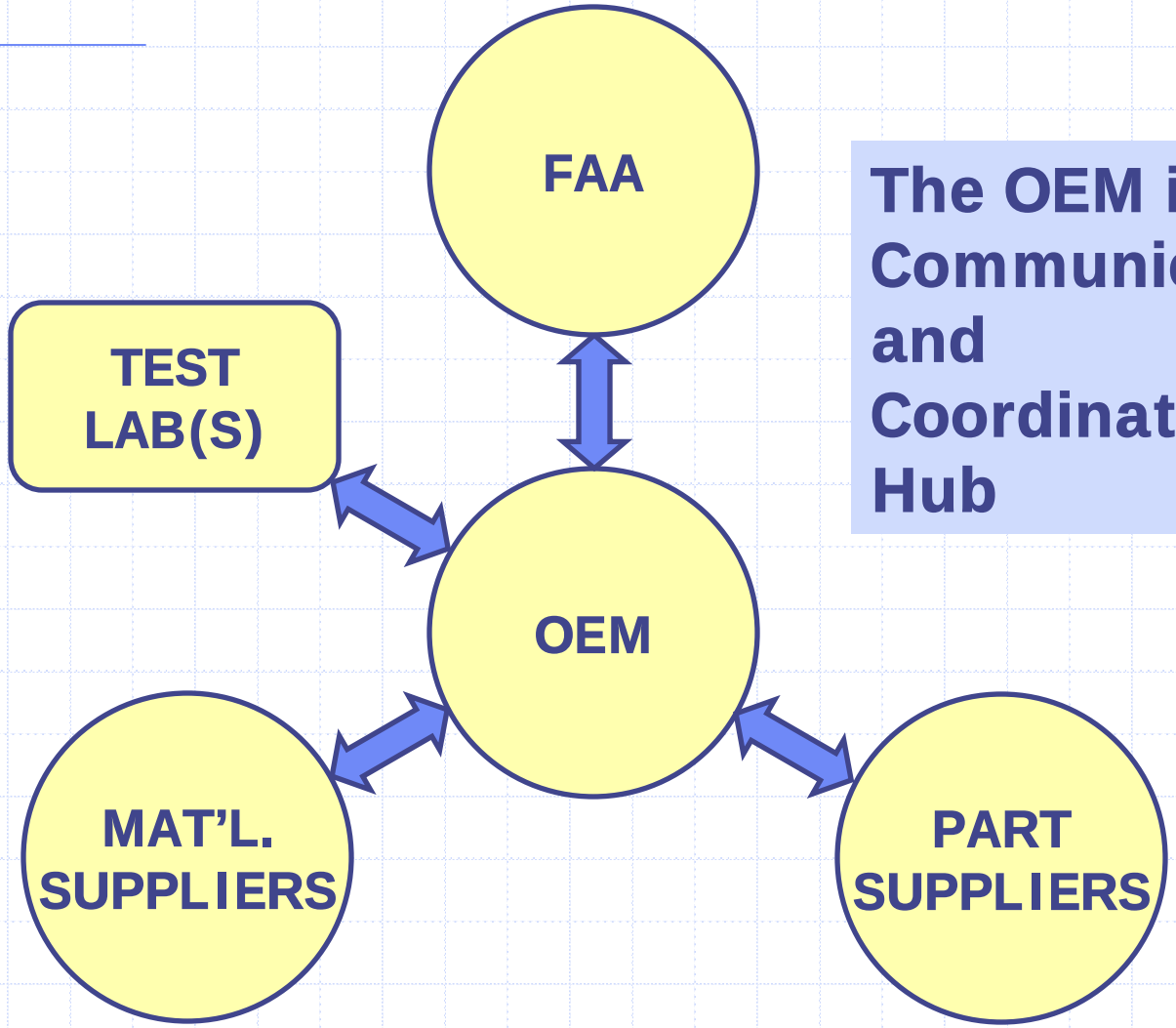
Communication and Coordination are Key



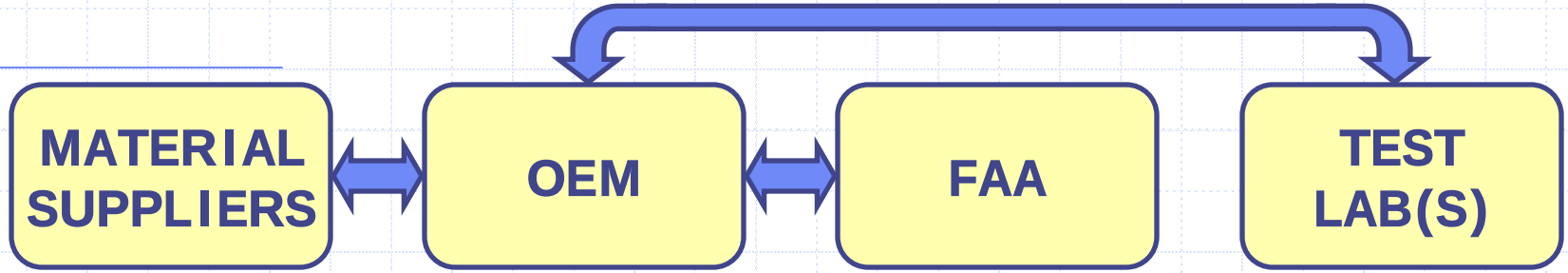
The OEM is the Communication and Coordination Hub

Roles and Responsibilities Matrix

● = Primary Participant

	OEM	Mat'l. Suppliers	Part Suppliers	FAA	Test Labs
Mat'l. Qual. / Allowables					
Qualification Testing	●	●		●	●
Equivalency Testing	●	Mat'l. ● Chg.	New ● Supplier	●	●
Material Specifications	●	●		●	
Process Specifications	●	●	●	●	
Product Scaling					
Cure Cycles	●	●	●	●	
Part Geometry	●		●		
Failure Modes	●				
Other Considerations					
Composite Struct. Design	●				
Proof of Structure	●			●	
Manufacturing Interface	●		●		
Maintenance Interface	●			●	
M&P Change Control	●	●		●	

Qualification Testing



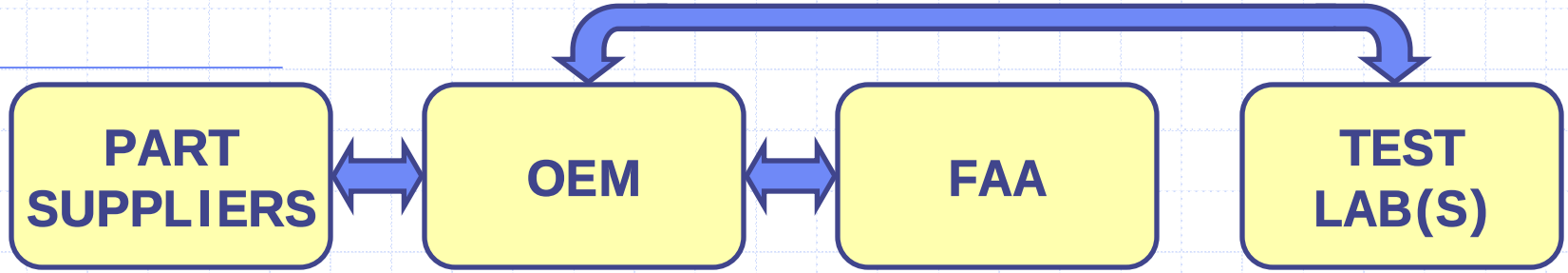
- Provide input to qual. test plan
- Provide qual. material batches
- May perform some or all qual. testing
- May cost-share qual. testing expense with OEM
- Review Spec. Limit values

- Write test plan
- Submit plan to mat'l. suppliers & labs for review and FAA for approval
- Contract test lab(s)
- Coordinate testing
- Reduce data for Mat'l. Allowables and Spec. Limit values
- Write test report
- Submit test report to FAA for approval

- Review / approve qual. test plan
- Conduct test conformity inspection
- Review / approve qual. test report

- Review / understand details of test plan
- Fabricate test panels
- Conduct testing
- Work with FAA (DARs, DERs) for conformity inspection and test witnessing
- Submit complete test data to OEM

Equivalency Testing
for a New Part Supplier



- Provide process information input to equiv. test plan
- Fabricate test panels / parts

- Write test plan
- Submit plan to part suppliers & labs for review and FAA for approval
- Contract test lab(s)
- Coordinate fabrication and testing
- Reduce data for equivalency
- Write test report
- Submit test report to FAA for approval

- Review / approve equiv. test plan
- Conduct test conformity inspection
- Review / approve equiv. test report

- Review / understand details of test plan
- Conduct testing
- Work with FAA (DARs, DERs) for conformity inspection and test witnessing
- Submit complete test data to OEM

Equivalency Tied in with Process Specs. and Cure Cycle Scaling

Equivalency Testing
for a Material Change

- Provide details of proposed material change
- Fabricate test panels and conduct equivalency testing
- Amend Process Control Document (PCD)

- Assess impact of material change
- Write test plan
- Submit plan to mat'l. supplier for review and to FAA for approval
- Coordinate fabrication and testing
- Reduce data for equivalency
- Write test report and submit to FAA for approval

- Review / approve equiv. test plan
- Conduct test conformity inspection
- Review / approve equiv. test report

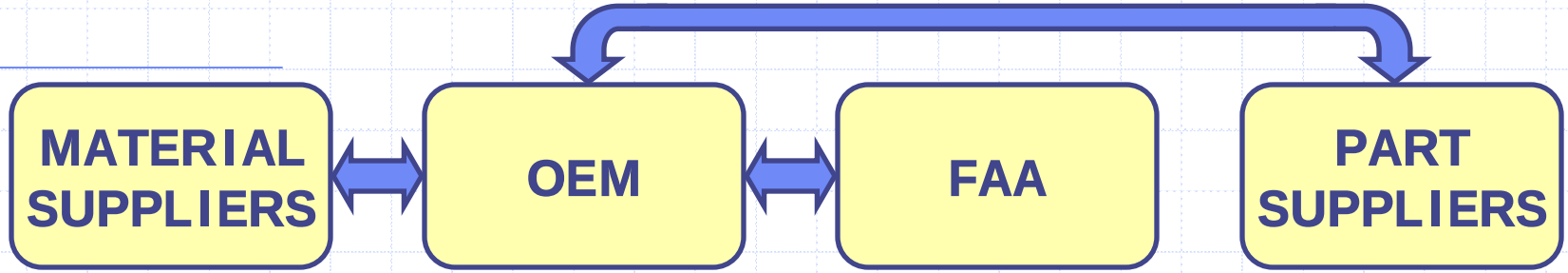
Material Specifications

- Review preliminary mat'l. specs. and provide feedback
- Write PCDs and coordinate with OEM
- Review / approve final material specs.

- Draft preliminary material specs.
- Submit preliminary specs. to mat'l. suppliers for review and to FAA (DER) for approval
- Work on PCDs with mat'l. suppliers
- Write final mat'l. specs. after qual. testing is complete
- Submit final specs. to suppliers & FAA (DER) for approval

- Review / approve preliminary material specs.
- Review / approve final material specs.

Process Specifications



- Review preliminary process specs.
- Provide process information and guidance on process parameters
- Review final process specs.

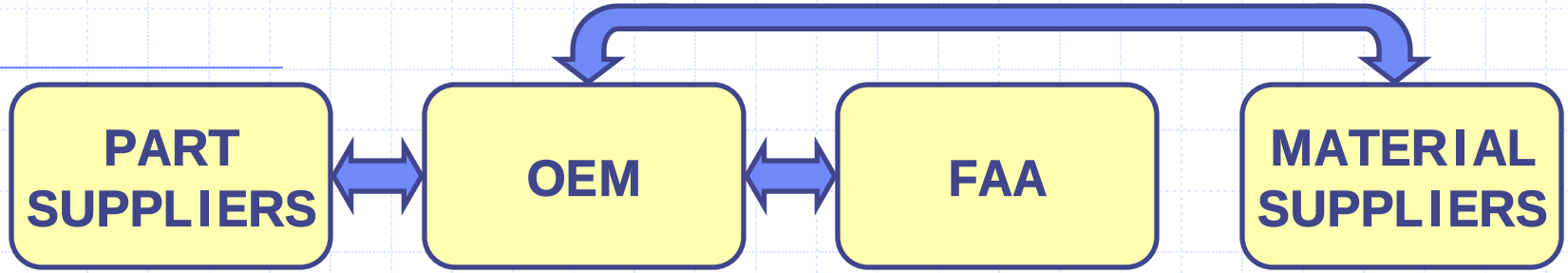
- Draft preliminary process specs.
- Submit preliminary specs. to mat'l. suppliers & part suppliers for review and to FAA (DER) for approval
- Write final process specs. incorporating supplier input
- Submit final specs. to suppliers & FAA (DER) for approval

- Review / approve preliminary process specs.
- Review / approve final process specs.

- Review preliminary process specs.
- Provide input on process details and variables
- Work with OEM and material suppliers to scale cure cycle **(see next slide)**
- Review / approve final process specs.

Process Specs. Tied in with Equivalency and Cure Cycle Scaling

Cure Cycle Scaling



- Conduct autoclave temperature surveys and heating rate studies
- Communicate production modifications to baseline cure cycle to OEM

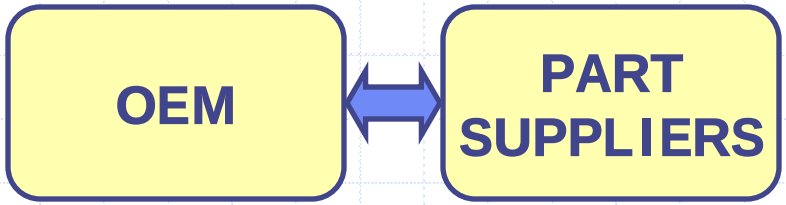
- Assess part supplier requested production cure cycles
- Work with material suppliers to verify full cure with cycle modifications
- Conduct equivalency testing to link modified cycle with qualification (baseline) cycle
- Incorporate modified cycles into process specs.
- Submit cure cycle equivalency data to FAA if required

- Review / approve production cure cycles and process specs.

- Advise OEM on effects of cure cycle modifications

Cure Cycle Scaling Tied in with Process Specs. and Equivalency

Part Geometry Scaling



- Work with part suppliers on tool modification, cure cycle modification, and part redesign to address part quality issues
- Conduct tool trials to assess complex part quality
- Communicate part quality issues to OEM

Failure Mode Scaling

OEM

- **Compare failure modes of elements and subcomponents with those of allowables test specimens**
- **Address unexpected part failure modes**
- **Define and conduct additional testing if necessary to substantiate structural adequacy**

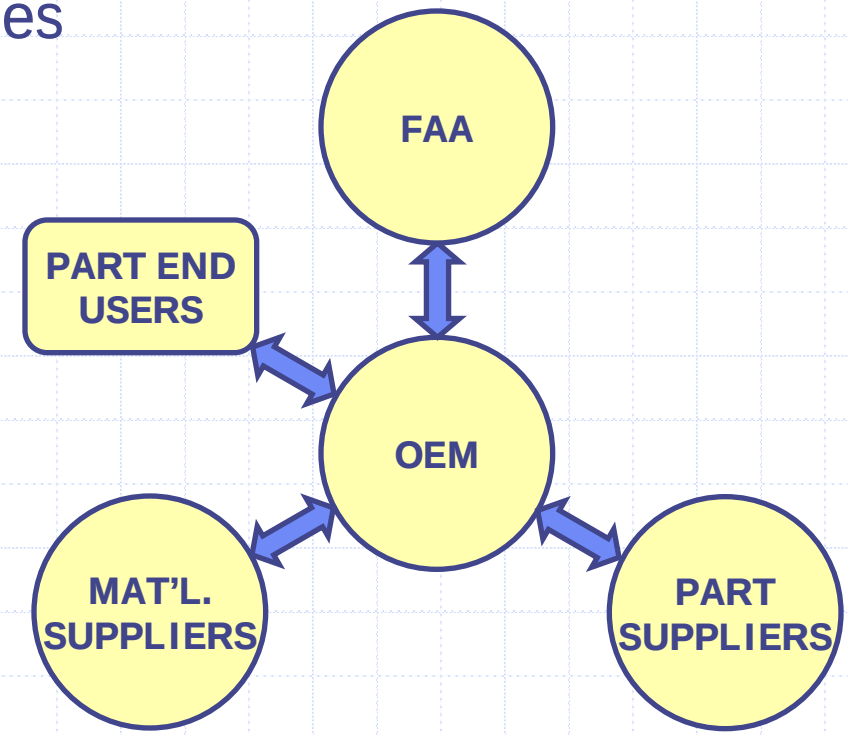
Other Considerations

These topics will be covered in more detail in other modules

- Composite Structural Design
  - Primarily the role of the OEM
  - Makes use of the Building Block approach
- Proof of Structure
  - OEM higher level Building Block testing
  - FAA oversight
- Manufacturing Interface
  - OEM and part supplier continual communication and coordination
- Maintenance Interface
  - OEM continual surveillance of fielded parts and products
- M&P Change Control
  - OEM and material supplier coordination of M&P specs. and PCDs

Ongoing Activities

- **Coordination and communication do not stop** after material qualification and production start-up
- **Sustaining Mode** includes
  - Part end user feedback
  - Rework and repair issues
  - Part supplier controls
  - Material supplier controls
  - Alternate materials
  - Design modifications



Conclusion

- Each entity has specific roles and responsibilities which **interconnect** with those of the other entities
  - **OEM** – Coordination Hub, Qualification Test Plans, Equivalency Test Plans, Allowables, Material Specs., Process Specs., Test Reports, Scaling
  - **Material Suppliers** – Material Specs., Process Specs., Cure Cycle Scaling
  - **Part Suppliers** – Process Specs., Cure Cycle Scaling, Geometry Scaling, Equivalency
  - **Test Labs** – Qualification Testing, Equivalency Testing
  - **FAA** – Test Plan Approval, Material Spec. Approval, Process Spec. Approval, Test Report Approval, Conformity Inspection
- All entities must **work together** from qualification to part / product fielding and beyond