

ASIA-PACIFIC ENGINEERING CONSULTING SERVICES, LLC

1001 Rivershore Road

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www.APECS.aero



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Topics of Discussion:

- **APECS History & Background**
- **FAA-DER & RS-DER Support**
 - **Component Repairs & Alterations**
 - **Aircraft Modifications/Alterations/Repairs & Lease Return Support**
 - **Supplemental Type Certification (STC)**
 - **Parts Manufacturer Approval (PMA)**
- **Regulatory Support; FAA, EASA, CAAC etc.**
- **Quality Control Support; AS9110, ISO etc.**
- **Marketing/Business Development Support**



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APECS Background & History

- Peter Stonefield, President & CEO of APECS, has a BS in Aerospace Engineering and an Masters degree in Business Administration. Over the course of his 25+ year career, Mr. Stonefield has worked for NASA-KSC and Trans World Airlines as well as with several MRO providers.
- Formed in Late 2007, APECS is an Engineering Consulting Firm that specializes in providing Support to Maintenance Repair Organizations (MRO's) which are involved in the Commercial and/or Military Aviation business; including Part 23 & 25 aircraft and Part 27 & 29 helicopters.



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Our Team Experience

Our Team enjoys a strong working relationship with the FAA, and can provide “Cradle-to-Grave” support of the processes described herein including providing all necessary paperwork, writing manuals, preparing and providing training procedures, setting up and performing necessary testing (including Flammability Testing), and all of the many other functions associated with the operation and maintenance of Commercial and Military aircraft and helicopters.



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FAA-DER Description

- A DER, Designated Engineering Representative is an individual appointed by the FAA to act as their Technical Surrogate for the approval of the Technical Data used in Major Repairs/Alterations, PMAs, STCs or other FAA-recognized functions.
- An FAA-DER must reside in the USA and hold an engineering degree or equivalent, possesses technical knowledge, have specific delegation experience, and meets the qualification requirements of FAA Order 8100.8.



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FAA-DER Description -- Cont'd

FAA-DERs can also:

- Consult on Client Repair and/or Modification Projects
- Create and Approve Aircraft Modification Data (STC's)
- Approve Alternate Replacement Parts (PMA's)
- Design and Approve Repair/Mod Approval Processes

Having an FAA-DER Approval is the SAME THING as if the approval was granted directly by the FAA, and it should be noted that DER Approved Repairs/Modifications are NOT in the CMM and are generally not approved by the OEMs.



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FAA-DER Experience

APECS Engineers and our Strategic Partners hold FAA-DER and RS-DER delegations in the following Technical Disciplines which cover the entire aircraft including:

- Acoustical Engineering
- Engine Engineering
- Flammability
- Flight Test
- Cabin Safety
- Power-plant Engineering
- Propeller Engineering
- Structural Engineering
- System & Equipment Engnrng
- Etc.



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Component Repair Development

In Considering Repair Development One Should Ask:

- What is behind the damage to the article?
- Is the article CRITICAL or Life-Limited?
- What are the Repair Processes available?
- Is the Repair Technically Viable?
- Is the article Cost-Effective to repair?

It is IMPORTANT to note that EVERY Part CAN BE Repaired, however it is the Responsibility of the Engineer to Determine if that part SHOULD BE Repaired. SAFETY IS NUMBER ONE



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Common Repair Processes

Some Common Repair Processes:

- 1) Gas Tungsten Arc Welding (GTAW) i.a.w. AWS D17.1:2001
- 2) Electro-Plating such as:
 - a) Chrome Plating i.a.w. Specification QQ-C-320
 - b) Nickel Plating i.a.w. Specification QQ-N-290
 - c) Cadmium Plating i.a.w. Specification QQ-P-416
 - d) Silver Plating i.a.w. Specification QQ-S-365
- 3) Metal Spray Application:
 - a) Plasma Spray i.a.w. Specification AMS 2437
 - b) High Velocity Oxy-Fuel (HVOF) i.a.w. Specification AMS 2447
 - c) Cold Spray i.a.w. Specification MIL-STD-3021
- 4) Installation of an insert, bushing etc



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Repair Specifications/Alterations

Examples of Damage to Common Articles – Valve Body

Damaged Area		Repair
<ul style="list-style-type: none">1) Main Bore2) Bearing Bores3) Flange4) Threaded Port <p>Pertains to: Flow Body, Pneumatic Valves, Anti-Icing Valve, and any other similar articles.</p>		<ul style="list-style-type: none">1) Plating or Metal Spray<ul style="list-style-type: none">a. Chromeb. Nickel + Chromec. HVOF Metal Spray2) See Item 13) GTAW Weld or Flange Replacement4) GTAW Weld or Cold Spray



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Repair Specifications/Alterations

Examples of Damage to Common Articles – Shaft

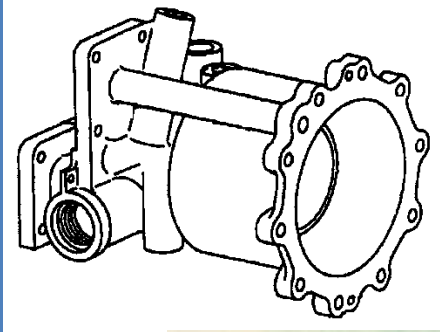

Damaged Area		Repair
<ul style="list-style-type: none">1) Outside Diameter2) Threads3) Through Holes <p>Pertains to shafts from: CSD/IDG, ACM, Air Turbine Starter, Valve, Actuator, or any other similar article.</p>		<ul style="list-style-type: none">1) Plating or Metal Spray<ul style="list-style-type: none">a. Chromeb. Nickel + Chromec. HVOF Metal Spray or GTAW Weld or Cold Spray2) See Item 13) See Item 1



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Repair Specifications/Alterations

Examples of Damage to Common Articles – ANY Housing


Damaged Area		Repair
<ol style="list-style-type: none"> 1) Bores 2) Threaded Ports 3) Miscellaneous Damage <p>Pertains to: CSD/IDG, ACM, Air Turbine Starter, Gear Box, Actuator, or any other similar article.</p>	 	<ol style="list-style-type: none"> 1) Plating or Metal Spray <ol style="list-style-type: none"> a. Chrome b. Nickel + Chrome c. HVOF Metal Spray 2) GTAW Weld or Cold Spray 3) GTAW Weld or Cold Spray



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Repair Specifications/Alterations

Examples of Damage to Common Articles – ANY Wheels

Damaged Area		Repair
<ol style="list-style-type: none"> 1) Bores 2) Vanes 3) Hub 4) Threads <p>Pertains to: ACM, Cooling Turbine, Air Turbine Starter, or any other similar articles.</p>		<ol style="list-style-type: none"> 1) Plating or Metal Spray <ol style="list-style-type: none"> a. Chrome b. Nickel + Chrome c. HVOF Metal Spray 2) GTAW Weld or Cold Spray 3) GTAW Weld, Cold Spray, or Insert Installation 4) GTAW Weld, Cold Spray, or Insert Installation



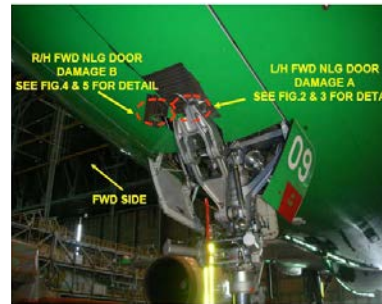
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Repair Specifications/Alterations

Examples of Damage to Structural Components (Incl Engine)

Damaged Area

- 1) Skin
- 2) Honeycomb
- 3) Structural Members
- 4) Other



Repairs

- 1) Addition of Doubler
- 2) Honeycomb Repair
- 3) GTAW Weld or Cold Spray
- 4) Other





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Repair Specifications/Alterations

Examples of Damage to Landing Gear Components

Damage

- 1) Wear
- 2) Corrosion/Pitting
- 3) Other

Repairs

- 1) Plating
- 2) GTAW Weld
- 3) Cold Spray
- 4) Other





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Repair Specifications/Alterations

A few words about Cold Spray....

Cold Spray is the newest form of Powdered Metal Application. The advantages of Cold Spray versus Plasma Spray is that it adheres to the parent material at the molecular level through hypersonic impingement and the powder itself is primarily comprised of powdered metal instead of plastic adhesion materials. More importantly, the strength of Cold Spray is similar to the Parent Material since it utilizes parent material in the Cold Spray Process.

Cold Spray application results in no Heat Affected Zone which makes it superior to welding when used as an alternative.



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Repair Specifications/Alterations

Examples of Excellent Cold Spray Candidate Articles:

Damaged Area

- 1) Pilot Diameter
- 2) Pump Pads
- 3) Bore
- 4) Threaded Ports
- 5) Eroded/Corroded areas

Pertains to:

CSD/IDG, ACM, Air Turbine Starter, Gear Box, Landing Gear, Wheels, Actuator, or any other similar article.





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Repair Specifications/Alterations

Technical Substantiation:

Once a Repair Process has been decided, it is important to consider the Technical viability of the repair as you develop the repair process. This is the foundation for “proving” the repair will result in a SAFE and quality part.

Details such as the weld filler rod, appropriate heat treats (pre and post) and post repair article strength characteristics can be determined through basic engineering practices such as the review of current welding standards and the calculation of the Factor of Safety (Fs) for the repaired part.



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Aircraft Modifications

Our DERs can approve TECHNICAL DATA in support of both Internal and External Aircraft Modifications:

- Interior Modifications including Seating, IFE, etc.
- Exterior Modifications including Painting, Logos, etc.
- Modification/Product Improvements for Aircraft, Engines, APUs and Associated Components.
- Incorporation of ADs, SBs and AMOC development
- Lease Return Support and release to the Lessor



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Aircraft Modifications

There are several types of Approvals our team can support such as:

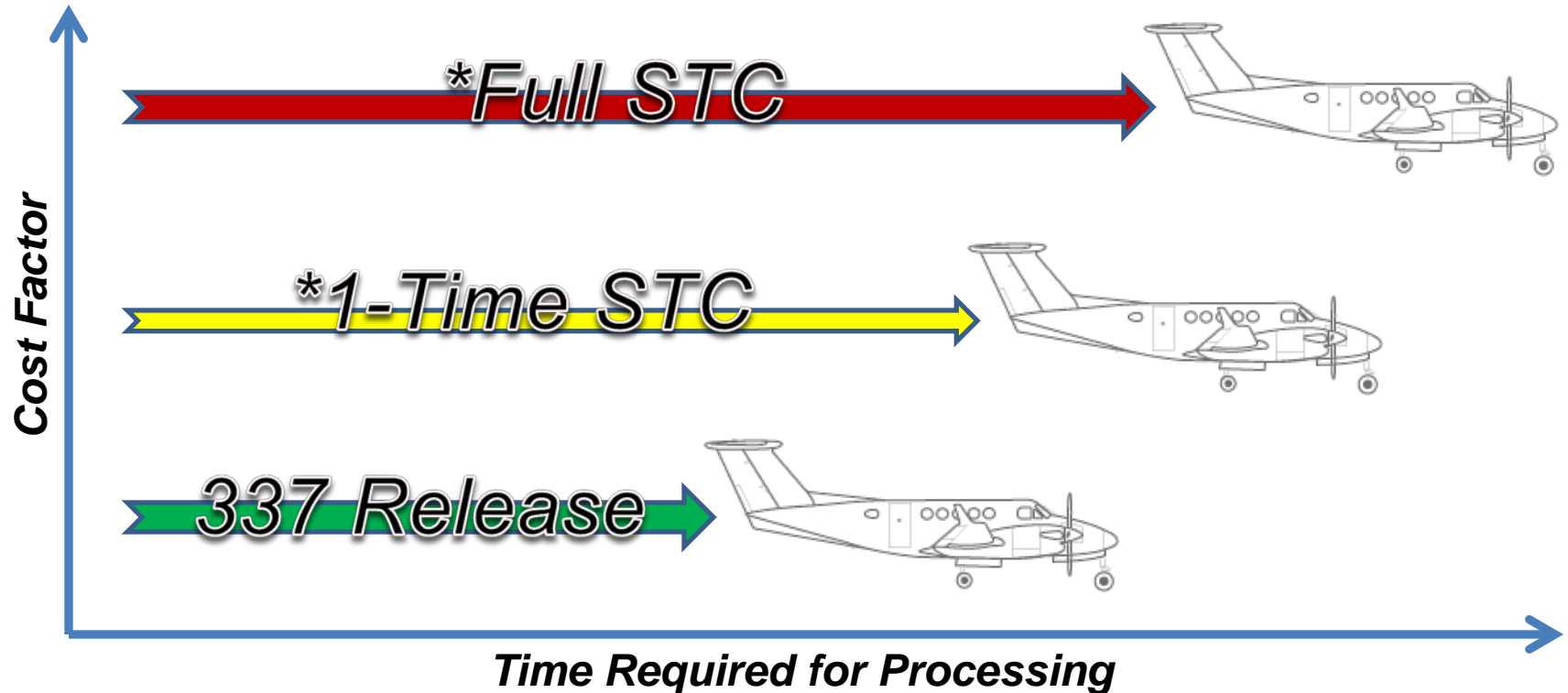
- Supplemental Type Certificates (STCs)
- 1-Time Supplemental Type Certificates (STCs)
- FAA Form 337 Field Release with FAA 8110-3s

These can be used to support Fleet Upgrades, Temporary Changes, Lease Returns and a number of other situations.



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Relationship of Approval Process Time vs Cost



***NOTE: A Form 337 Release is also required after STC mod completion**



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Supplemental Type Certificates (STC)

A Supplemental Type Certificate is (STC) is a type certificate (TC) issued when an applicant has received FAA approval **to modify an aircraft from its original design**. The STC is applicable when a single MAJOR change or a series of MINOR changes change the OPERATING CHARACTERISTICS of the aircraft.

A DER may approve Technical Data associated with an STC Application and act as an agent to support that application through the FAA Approval Process, and an ***FAA FORM 337 IS STILL REQUIRED TO RELEASE THE AIRCRAFT TO SERVICE.***

Reference FAA Order 8100.4; Type Certification



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Supplemental Type Certificates (STC)

A Supplemental Type Certificate is (STC) differentiates the ORIGINAL type certificated design to create a NEW type of airplane.

An STC gives the applicant/owner of the STC PRODUCTION approval to perform the repair/alteration across the entire or a broad range spectrum of the TC family.

An STC is generally used when an applicant wants to MARKET or LICENSE the design changes/product improvements.

Reference FAA Order 8100.4; Type Certification



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One-Time STC

A One-Time Supplemental Type Certificate (STC) may be issued for a particular aircraft(s), identified by make, model, and serial number(s). A One-Time STC is also used **to modify an aircraft from its original design**, but the STC holder is **not eligible** for production approval.

A DER may approve Technical Data associated with an STC Application and act as an agent to support that application through the FAA Approval Process. The One-Time STC application process is an abbreviated version of that used for a Full STC Application.

FAA FORM 337 IS STILL REQUIRED TO RELEASE THE AIRCRAFT TO SERVICE.

Reference FAA Order 8100.4; Type Certification



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FAA Form 337 Release

An FAA Form 337 Release is also known as a Field Approval, and is a method by which an FAA-DER approves technical data used to accomplish a major repair/alteration on a single aircraft; **provided the repair/alteration is not classified as a major change in type design according to the provisions of FAA Order 8100.4; Type Certification.**

THIS IS A COMMON FORM OF CHANGE APPROVAL AND EQUIVALENT IN TECHNICAL APPROVAL LEVEL TO STCs.

Reference FAA Order 8100.4; Type Certification



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Parts Manufacturing Approval (PMA)

A PMA Part is a replacement part or assembly manufactured by an entity for the purpose of selling that part or assembly to an operator or other third party. A PMA part can only be owned/produced by an entity approved by the FAA Manufacturing Inspection District Office (MIDO).

There are three main types of PMA Approval Methods:

1. Identity with License
2. Identity without License
3. Test & Computation



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Parts Manufacturing Approval (PMA)

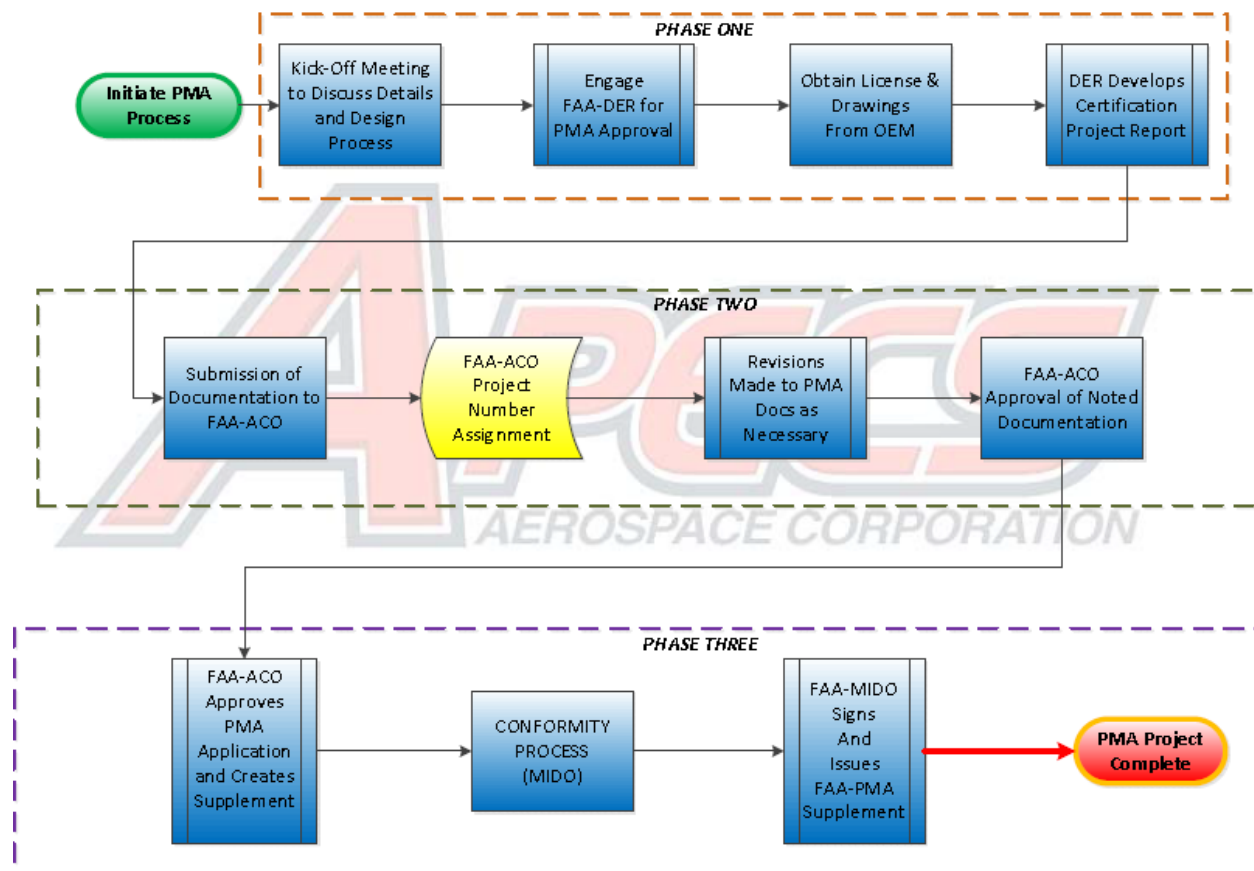
Our Team can work with clients to develop their internal structure and resources such as manuals, inspection processes, and other relevant tangible items necessary to be able to produce PMA parts.

We can also provide complete support from the application process through final first article inspection and PMA Supplement awarding by the FAA MIDO.



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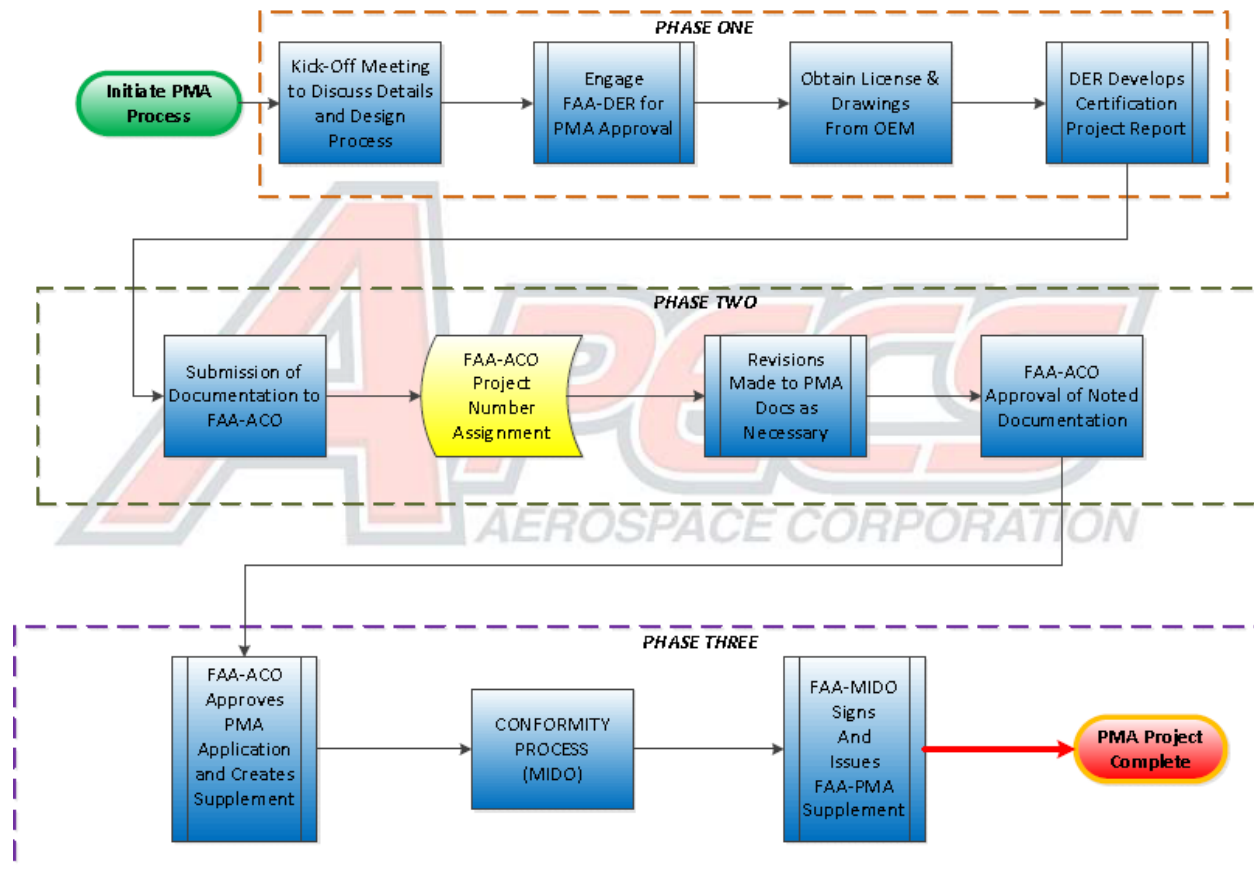
PMA with License Flowchart





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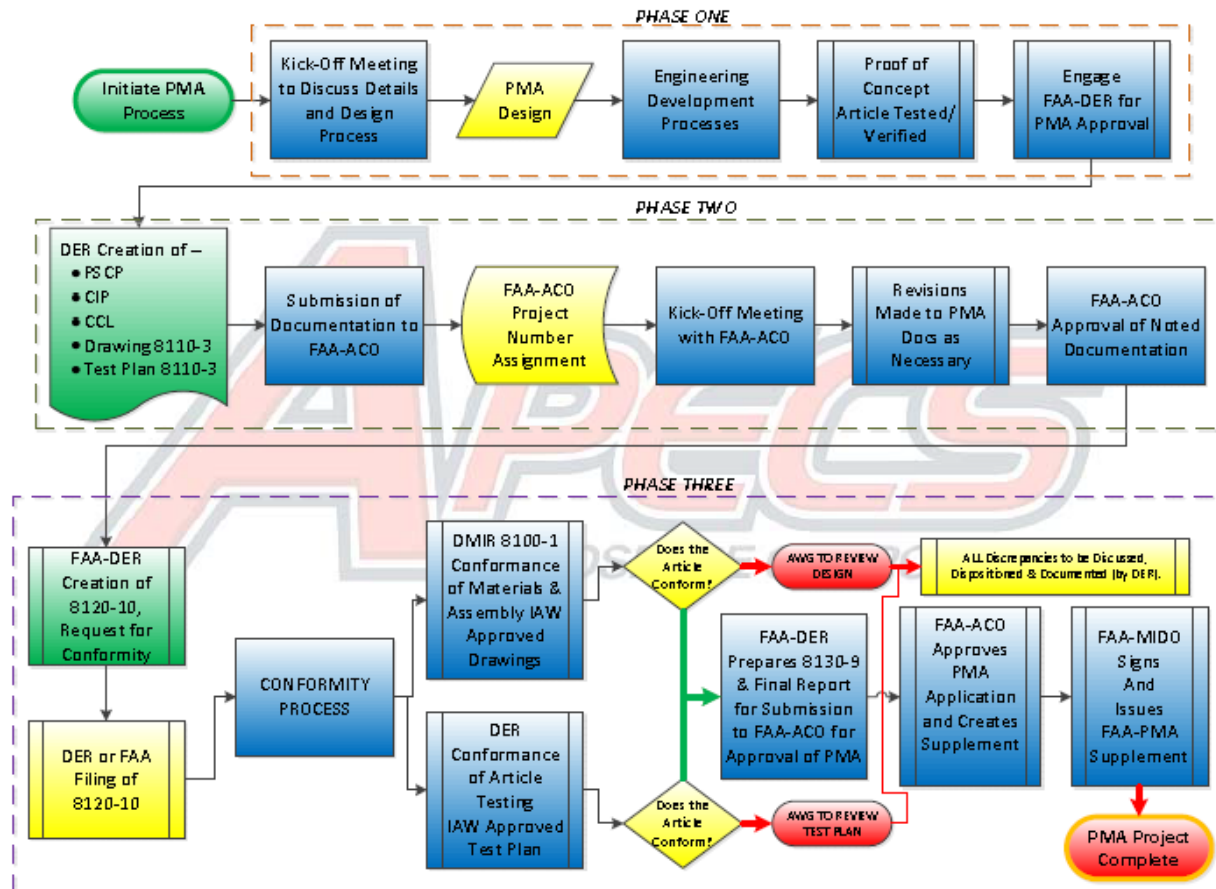
PMA without License Flowchart





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PMA by Test & Computation





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Regulatory Support; FAA, EASA, CAAC etc.

APECS has substantial experience in providing our clients with Regulatory Support including:

- Repair Station Rescue
- New Certification and Renewal Activities
- Development of all necessary Regulatory Manuals
- Development of complex 145 Processes/Documents
- Development of all necessary QA Processes/Documents
- Audit Support including Conducting Pre-Audits
- Training to all aspects of Repair Station Operations



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Quality Control Support; AS91XX, ISO etc.

APECS has substantial experience in providing our clients with Quality Control Support including:

- New and Renewal QC System Certification Activities
- Development of all necessary QC/QA Manuals
- Development of complex QA/QC Processes
- Audit Support including Conducting Pre-Audits
- Training to all aspects of the respective QC/QA Programs



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Marketing/Business Development

APECS has substantial experience in providing our clients with Marketing/Business Development Support including:

- Developing comprehensive Marketing/Business Plans
- Providing GLOBAL Marketing and Representation
- Developing New Markets and Re-Invigorating Old Markets
- Providing Solutions for Internal Business Expansion
- Managing Sub Contracted Repair Processing



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Why Use APECS?

- Creation of Direct Cost Savings
- Having an Experienced Team at your fingertips for:
 - Aircraft/Powerplant Repairs/Modifications
 - Aircraft/Powerplant Component Repairs/Modifications
 - Developing STCs, PMAs, AMOCs, etc
 - Repair Station Rescue and 145 Process Support
 - Development of enhanced QC Processes
 - Enhancing Marketing/Business Opportunities
 - Direct Generation of In-House Capabilities
 - Providing clients with New Competitive Advantages

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***Thank You for
your time.***

Questions?

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