

# *NCE* *North Composites Engineering* **Aeroskills**

*Specialists in aircraft structural composite repair training, support services and equipment supply.*



- ⤴ World class specialist provider of composite training North Composites Engineering (NCE) incorporating Aeroskills International provide composite repair and the latest metal to metal bonding training to the aircraft composite sector.
- ⤴ Our courses provide the practical skills and development to enable staff to work directly on aircraft repair after course completion.
- ⤴ We comply with the training requirements to validate the CAA licence with regard to composite repair.
- ⤴ We are specialist BAE Systems approved trainer for military aircraft composite repair courses.
- ⤴ Our services include active repair, project management, specialist advice, plant and equipment specifications to comply with productivity and safety requirements.

## *Specialist Aircraft Structural Repair Training*

We provide industry trusted essential aircraft structural repair training for repairers, inspectors, approvers and design authority personnel from novice to experience practitioners to maximise compliance with aircraft SRM requirements.

Our customers are positioned globally and consist of most of the Tier 1 and aircraft maintenance companies and include companies such as Rolls Royce, Safran, BAE, Solvay, GKN, Bombardier, KLM and British Airways. We deliver courses that suit all aircraft types from Lear jets to the latest wide-bodied airliners. We are recognised by BAE Systems due to our significant contribution to their services and customers with quality management approvals.

Our scheduled courses are offered throughout the year, in addition we also offer tailor made courses to customers' specifications. We will actively work with your company to introduce specific challenging aircraft repairs into our training activities to provide added value and can supervise your ongoing in-house training and development activities.

Our aircraft courses comply with the requirements of AT 104 class IV specification. Our courses and trainers meet the requirements of the CAA and Tier 1 aircraft manufacturers training recommendations for composite training and comply with J.A.R. Part147 approved maintenance training. All our instructors are professionally qualified engineers compliant at the highest grade by the Boeing advisory circular FAA AC65-33 and hold formal teaching qualifications.

We are the only recognised composite trainer to hold JOSCAR (Joint Supply Chain Accreditation Register) accreditation requiring external verification of our course and staff quality.



### Aircraft Structural Repair Course Schedule 2024

| Course Code | Title   | Date   | Price*   |
|-------------|---|--|----------|
| ACW004      | Aircraft Composite Awareness<br><br><b>**NEW Course**</b>     | 5 days dates on application  | £2068.00 |
| AC001       | Advanced Aircraft Composite Repair 1                          | 8th - 19th January 2024<br>11 <sup>th</sup> - 22 <sup>nd</sup> March 2024<br>13 <sup>th</sup> - 24 <sup>th</sup> May 2024<br>8 <sup>th</sup> - 19 <sup>th</sup> July 2024<br>16 <sup>th</sup> - 27 <sup>th</sup> September 2024<br>11 <sup>th</sup> - 22 <sup>nd</sup> November 2024 | £2635.00 |
| AC003       | Advanced Aircraft Composite Repair 2                          | 15 <sup>th</sup> - 26 <sup>th</sup> April 2024<br>7 <sup>th</sup> - 18 <sup>th</sup> October 2024  | £2866.50 |
| AC002       | Aircraft Composite Inspection                                 | 3 <sup>rd</sup> - 7 <sup>th</sup> June 2024<br>9 <sup>th</sup> - 13 <sup>th</sup> December 2024  | £2068.00 |
| ACM01       | Metal to Metal Bonding 1                                      | 19 <sup>th</sup> - 23 <sup>rd</sup> February 2024<br>21 <sup>st</sup> - 25 <sup>th</sup> October 2024  | £2165.00 |
| ACM02       | Metal to Metal Bonding 2                                      | 5 days dates on application  | £2165.00 |
| AC010       | Composites for Engineers 1<br>Design, Test and<br>Manufacture | 5 days dates on application  | £1512.50 |
| AC011       | Composites for Engineers 2<br>Structural Performance          | 5 days dates on application  | £1512.50 |
| HOT01       | Hotbonder Use Certification                                   | As AC001   | £220.00  |

\*All quoted prices are subject to VAT at the standard rate at the time of booking.

The Hotbonder use certification training satisfies the civil aviation authority requirements for certified personnel to operate a hotbonder in a repair process.

## Re-validation/Refresher Courses for Aircraft Structural Repair - Composites and Metal Structures Civil Aircraft

The aim of the aircraft structural repair refresher courses complies with EASA continuation training requirements. If you have a gap in aircraft structural repair activities of 9 months or a period of 24 months has passed since your original training, we offer the following 2-day courses.

- **AC001 Aircraft Structural repair 1 refresher course AC001R (£770+VAT).** Within this course we will carry out a monolithic and cellular repair and verify the damage allowable criteria.
- **AC003 Aircraft Structural Repair 2 refresher course AC003R (£880+VAT).** Within this course we will carry out an edge reconstruction repair and establish the methodology required to repair extensive crack propagation from an attachment point in a critical component.
- **ACM01 Metal to Metal Bonding 1 refresher course ACM01R (£880+VAT).** Within this course we will implement a skin and damaged core repair to consolidate the methods of combining a range of anodising techniques.
- **ACM02 Metal to Metal Bonding 2 refresher course ACM02R (£1045+VAT).** Within this course we will implement a repair to a prior repaired through damage location and consolidate damage allowable

### Specialist and Bespoke Courses

Bespoke courses can be specifically tailored to your own requirements please call to discuss your needs; training can be arranged on a one to one basis or for company based groups. Bespoke courses are individually priced following discussion of requirements and include trainer related expenses.

**Specialist approved restricted Military Aircraft courses** are available upon request, if you are involved in the repair of military aircraft please contact us to discuss our approved courses and your requirements.



## Safety Wear

- ⤴ All course fees are per delegate per course and include provision of materials, tools, protective clothing (excluding footwear) course hand-outs lunch and refreshments.
- ⤴ Delegates must wear full length trousers and closed leather shoes or safety footwear as appropriate to the course.
- ⤴ All courses incorporating a practical element require safety footwear.



Safety Footwear  
**Must** be worn

## Course Descriptions

**Course Title: Advanced Aircraft Composite Repair 1**

**Course Code: AC001**

**Duration: 10 Days**

**Course structure: 20% theory, 80% practical**

**Who is it for:** This course is intended for those members of staff who will be carrying out repairs on composite aircraft structures. It will give them sufficient knowledge to be able to complete the repair to approved aerospace standards. No previous knowledge required.

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### Course content

**BAE SYSTEMS**

**Approved course**

The approach to composite repair and the recommendations given by manufacturers are constantly changing as more experience has been gained by the industry. The course content has been devised to respond to these changes and now reflects the current requirements for composite repair within the industry.

The repair techniques specified in the aircraft manufacturers' structural repair manuals will form the basis of the course. These techniques can be related directly to a number of aircraft types such as the Boeing 747, 757, 767, 787, Airbus A319/320/321. The theory elements support and are appropriate to enable the delegates to understand the important principles and safety requirements of composite materials and produce quality repairs.

The techniques used are those currently recommended in manufacturers structural repair manuals and emphasis is placed on the requirements to adhere to these procedures. The importance of quality assurance is stressed throughout and attention is paid to the adoption of quality control procedures and safety within the repair process. The course satisfies ATA 104 IV objectives.

### The course aims to:

- familiarise the delegate with the materials and techniques used to manufacture and repair composite components.
- provide the delegate with the knowledge to satisfy the appropriate health and safety requirements.
- equip the delegate with the knowledge and practical skills required to carry out sound and effective repairs on composite aircraft components, according to the methods recommended and accepted by the aircraft manufacturers.
- provide the knowledge required to interpret standard structural repair manuals and to relate them to a given repair situation.
- familiarise the delegate with a wide range of structural repair methods so they can find all the relevant information relating to a particular repair.

## The course covers:

### Week 1

Delegates will be introduced to composites, the fibres and resins used in their structure, their properties, behaviours and the reasons for their use in aircraft components. The importance of correct resin/fibre/hardener ratios and the requirement for good health and safety practices are emphasised. Delegates prepare a reinforced composite 'patch or doubler' by hand lay-up to familiarise them with the materials and correct procedures in the handling of composites together with the importance correct volume fraction and layer orientation.

The techniques of vacuum bagging and various heat curing methods used for advanced composite repair on aircraft structures are introduced and the delegates produce vacuum bags and heat cured monolithic structures.

The delegates produce laminates with different orientations to use in an exercise to explore the impact of fibre orientation. The impact of surface preparation the importance of following the correct procedures is demonstrated during the manufacture of the vacuum bags and laminates. Correct and incorrect procedures for surface preparation will be demonstrated, continual use of good practice is emphasised throughout the course.

The advantages, reasons for use and special characteristics of honeycomb cores and their use within aircraft structures is demonstrated. The techniques of bonding, cutting, machining and orientation are demonstrated and practiced with Monolithic and Nomex cored composite panels extensively in flat, curved and complex curved components.

The delegates are introduced to the different types of damage and repair that can occur in operation. Various manufactured panels are damaged and repaired in accordance with the appropriate structural repair methods by the delegates. This includes methods of cutting cores and laminates, with details of the tools to use, recommended cutting speeds and handling. Monolithic and cellular panels with various orientation and material types will be damaged and inspected using simple NDT techniques specified in SRM's to assess the damage boundaries and implement benchmark SRM procedures.

By the end of the first week the delegates will be familiar with and at ease with SRM's procedures together with the use of sanding and measuring tools, assessment of damage, repair of monolithic panels and skinned panels together with methods of core damage and removal assessment procedures. At this point the delegates will be confident with the use of curing systems including the operation of ovens, hotbonders and Infrared systems together with a thorough understanding of surface preparation assessment and the consequences of non-compliance.



Week 2

Introduces repairs methods upon cellular systems including skins, core damage, core removal and filling, through damage, lightning strike, proximity damage and consequence of poor repair with rectification procedures to form a foundation for real world application commencing and accumulating in a formal assessment activity utilising aircraft components.

Manufacturers SRM's are used throughout the course with a clear bias towards repair implementation methodology to address the increasing repair demands of the cellular and monolithic systems. The delegates will face staged repairs to build skill, knowledge and confidence, focusing upon skins and cores in flat and complex components. The course will provide the key knowledge required to manage repair implementation of co-cured and co-bonding repairs.

Under pinning the practical aspects of this course is a firm understanding and implementation of reporting and documentary procedures demanded by the various aircraft manufactures as part of the Part 145 approval protocols. These procedures will be related to the practical experience gained during the course in terms of ease of use, quality of repair and common-sense considerations together with the mandatory reporting procedures and practices associated with aircraft repair processes.

Methods of damage assessment and guidance in choosing the most appropriate method of repair for a multi stage repair are explored, including the choice between wet lay-up and pre-preg repair. Full puncture damage repair to panels will be carried out using pre-preg materials along with recommended methods of moisture removal and finishing.

Allowable damage, repair decision making and test procedures will be introduced, interpretation of the data relating to, choice of materials and repair method will be discussed in depth. Both destructive and simple non-destructive test methods are demonstrated and utilised.

An on-going exercise utilised as a formal assessment will be carried out by each delegate throughout the second week. This will be based on a real-world repair situation and involve damage assessment, determination of the component construction, choice of repair method and materials. All relevant information sources will be available including manufacturer's SRMs, data sheets and part drawings.

To complete the course the delegates will be continually assessed and must pass a practical job and an end of course multiple-choice assessment paper.



**Course Title: Advanced Aircraft Composite Repair 2**

**Course Code: AC003**

**Duration: 10 Days**

**Course structure: 20% theory, 80% practical**

**Who is it for:** This course is intended for those members of staff who will be carrying out repairs on composite aircraft structures. The course is a follow-on course from the Aircraft Composite Repair 1 course AC001, delegates will have satisfactorily completed AC001 or equivalent prior to attending this advanced course.

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## Course content

**BAE SYSTEMS**

**Approved Course**

This Advanced Composite Repair 2 course has been developed in response to our aircraft customers demand for a follow up course to address in detail complex repair requirements as stipulated in the SRMs. Alongside developing skills in repair techniques, the course introduces some of the newest techniques that have been introduced for the latest aircraft.

The techniques used in the training have been well proven and are based on those given by aircraft manufacturers; these are supported by appropriate current and relevant theory as appropriate, this theoretical content allows the delegate to produce quality repairs using the correct materials and procedures and to work safely. The importance of quality assurance is stressed throughout with particular attention being paid to the adoption of quality control procedures throughout the repair process. The course satisfies ATA 104 IV objectives.

### The course aims:

- to provide an in-depth knowledge of repair rationales across a breadth of repair situations.
- to equip the delegate with the knowledge to undertake complex repairs in line with SRM stipulations.
- to equip the delegate with the knowledge and practical skills required to carry out effective repairs to bolted, riveted and bonded assemblies.
- to provide the delegates with the appropriate experience of manufacturing tooling required to complete complex repairs.
- to familiarise the delegate with a wide range of structural repair methods so that they can implement the latest methods of repair.
- to satisfy all the relevant quality assurance and safety requirements.



**The course covers:**

Week 1

Review SRM material processes and repair methodologies for a wide range of aircraft types including Boeing and Airbus.

Understand and apply programming of hot bonders, ovens and infra-red lamps followed by methods of calibration for heat mats and curing equipment. Implement and complete a repair to a structural leading edge on an aircraft part.

Delegates select a repair approach and document the repair using the appropriate SRM for both a circular and split (non-circular) inboard damage to cellular system with gradual curved aerodynamic faces, delegates implement and carryout the documented repairs.

Complex edge damage repair techniques are introduced with the requirements for designated tooling and tooling manufacture methods and the behaviour of different tooling. Delegates identify, assess and carry out a repair to a structural part with significant corner edge damage in accordance with SRM specification using tooling they have produced.

Thickness and depth measurement techniques and their uses are introduced along with the use of NDT methods. Delegates perform NDT evaluations on the completed repairs and gain an insight to inspection and related NDT methods.

Week 2

The value and place of cosmetic, quick and flush repairs for aircraft structures is introduced and the delegates complete both a cosmetic and a quick repair in line with SRM guidelines.

A complex curved part with mechanical fixing points is evaluated, methods of mechanical joining at repair sites are demonstrated with both permanent and temporary fastenings. Delegates plan, document and carry out a repair to a complex geometrical part with mechanical fastenings at the repair site with surface and penetrating damage.

The impact of implementing a restricted access penetrating damage repair is discussed and different methodologies for completing successful repairs where access is limited are evaluated.

Delegates perform a through panel repair where access is limited to one side in accordance with the discussed methodologies.

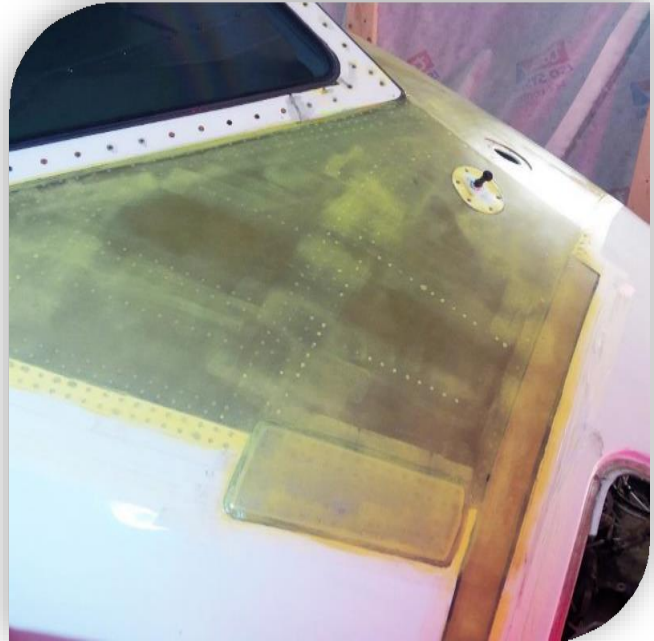
Lightning strike requirements, materials and repairs are introduced, the delegates perform a lightning strike repair and are introduced to the extended boundary risk of thermal degradation caused by the strike, together with associated specialist assessment equipment required.

New techniques used in the latest aircraft are introduced, delegates have the opportunity to carry out a DVD - double vacuum bagged debulk repair and layup placement following the designated new procedures.

To complete the course the delegates will be continually assessed and must pass a practical job and an end of course multiple-choice assessment paper.

### **Invitation**

Instead of using NCE stocked aircraft parts we welcome the opportunity to work with employers to utilise selected and specific aircraft parts to provide enhanced added value for the delegates. Please note any donated parts would be deemed scrapped following use within the course.





**Course Title: Composites for Engineers 1 Design, Test and Manufacture**

**Course Code: AC009**

**Duration: 5 Days**

**Course structure: 60% theory, 40% practical**

**Who is it for:** This course is intended for delegates with a good technical background in engineering, materials or mechanical design who require a comprehensive technical understanding of advanced materials, their use manufacture and test.

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### **Course content**

Composites for Engineers 1 is designed to provide engineers and technicians with a comprehensive technical overview of the materials and processes and the affect the materials and process choices have upon composite material performance.

The course considers in detail good practice in design, orientation effects, use of cellular systems, finish considerations, wet and dry layup techniques, laminate performance analysis, causes of laminate distortion, Non-Destructive Testing (NDT) and other testing requirements in both components and tool design. Practical activities support the theory and are used to demonstrate the interaction between design, material and process choice along with the opportunity to practice NDT and analysis techniques. The course satisfies ATA 104 IV objectives

### **The course aims to:**

- compare composite material their uses and application.
- specify suitable material characteristics for a given application.
- enable delegates to be able to describe the difference between traditional and advanced materials in relation to the appropriate design criteria.
- give an appreciation of the use of composite materials and their effects upon component design and manufacture.
- develop an appreciation the impact of mould design to maximise performance expectations of composites.
- develop an understanding of mechanical testing and the use of NDT in the design and manufacture of composite components.



**The course covers:**

Introduction to laminate theory, orientation effects, fibre and resin properties. Good practice in design and the impact of loading parameters taking into account the principle stresses and maximum shear that the component is subject to are considered along with the load paths and supporting structural needs to produce fit for purpose design. The impact of fibre orientation, curing schedules and hygrothermal effects and the influence of the tooling design and the manufacturing process will be taken into account.

The key weaknesses of component performance will be evaluated with regard to inter lamina shear and how these effects can be overcome by good design practice and the application of design centred criteria.

Consideration of tool design in terms of the impact of thermal expansion, surface finish and release surfaces influences will be explored in terms of component, mould design and component release influences.

Laminate performance analysis, causes of laminate distortion will be demonstrated through the use of physical testing.

Non-Destructive Testing (NDT) and other testing requirements in both components and tool design will be reviewed with simple NDT techniques being utilised through-out the practical activities.

Practical activities – manufacture laminates of different orientation to carry out mechanical testing to evaluate tensile, torsional and bending properties of laminates against laminate theory.

Delegates will have the opportunity to experience handling a variety of fabrics in the form of dry fabrics and pre-pregs used for manufacture. Delegates will have the opportunity to use wet lay-up and pre pregs to produce their own parts, considering the theoretical elements discussed.

Delegates have the opportunity to produce a part using resin infusion techniques and compare this to the hand layup techniques previously used.



**Course Title: Composites for Engineers 2 Structural Performance**

**Course Code: AC011**

**Duration: 5 Days**

**Course structure: 50% theory, 50% practical**

**Who is it for:** This course is intended for delegates with a good technical background in engineering, materials or mechanical design who have completed composites for engineers 1 and wish to further their knowledge of composite materials, manufacture and analysis.

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### **Course content**

Composites for Engineers 2 builds on the principles and practices developed in Composites for Engineers 1. The course focus is upon taking a product from concept, through design and manufacture to prototype and analysis with consideration of ROI. This approach enables the further understanding of the design of materials for structural performance, the design of joints and bonds, mould design, repair methods and surface treatments. Greater emphasis is placed upon material performance analysis and resin flow characteristics and the latest processing techniques of Resin Infusion and Resin Transfer Moulding. The course satisfies ATA 104 IV objectives.

### **The course aims to:**

- develop an understanding of component development from concept design to analysis and manufacture.
- develop design parameters to aid in good design for manufacture
- show the use of design envelopes to support the design process
- enable the delegates to select appropriate prototype build methods and manufacturing methods for cost effective solutions.
- enable delegates to select materials and specify mould design for ROI.
- develop an understanding of the use of computational analysis in the design process.



**The course covers:**

The course extends the understanding of the design of materials for structural performance, examining the impact and role played by the choice of fabric, weave pattern the impact of cutting, draping and shaping for complex parts while maintaining the orientations specified by the design parameters. Such areas as the effects of spring back within design and manufacture and the methods used to reduce the effect are introduced.

The principles and practical effects of joining composites using mechanical fastenings, inserts and adhesive joints along with the impact of each on the mechanical properties of assemblies is demonstrated using real applications and case studies.

Complex and multi part mould design and the routes to failure due to poor mould design and preparation are evaluated along with issues of part separation. The need for effective repair methodologies within manufacture and service are explored along with the effect of human factors in the design and manufacturing operations.

Greater emphasis is placed upon material performance analysis and resin flow characteristics to enable an understanding of the influence of these parameters on the latest processing techniques of Resin Infusion and Resin Transfer Moulding.

The theory and practical aspects of the course focus upon the development of a product from concept to prototype, the product is utilised to develop the design, manufacturing and analysis elements of the course alongside the volume requirements which influence the manufacturing options and the overall ROI.

Practical activities support the theory and are used to demonstrate the interaction the processing techniques and analysis of performance, thermal effects and flow characteristics and underlying theoretical principles and includes the use of computational analysis to support design and processing parameters.



**Course Title: Aircraft Composite Inspection**

**Course Code: AC002**

**Duration: 3 Days**

**Course structure: 20% theory, 80% practical**

**Who is it for:** This course is intended for those members of staff who will be carrying out inspection to composite repairs on aircraft structures. It will give them sufficient knowledge to be able to complete the inspection to approved aerospace standards. It is recommended that prior to commencing the inspection course that delegates complete AC001.

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### **Course content**

The emphasis of the course is on developing the background knowledge necessary to inspect and sign off aircraft composite repairs and to ensure that they have been carried out in accordance with published manufacturers' structural repair manuals. The course contains some practical demonstrations to highlight areas of potential problems

The importance of quality assurance is stressed throughout, recognising good and bad practices within the repair procedure.

### **The course aims to:**

- to familiarise the delegate with the materials and techniques used to repair aircraft composite structures.
- to provide the delegate with the knowledge to satisfy the appropriate health and safety requirements.
- to equip the delegate with the knowledge to inspect aircraft composite repairs as they are carried out and to be able to sign them off as being completed according to the methods recommended and accepted by the aircraft manufacturers.
- to familiarise the delegate with the proper storage and handling of composite materials and to recommend effective methods of record keeping.
- to allow the delegate to recognise bad practices.
- to provide the knowledge required to interpret standard structural repair manuals and to relate them to a given repair situation.
- to satisfy all the relevant quality assurance requirements.





**The course covers:**

Delegates will be introduced to the characteristics of the materials used in repair. This will equip them with the knowledge to ensure that the procedures carried out during a repair are appropriate to the materials being used. The health and safety procedures and requirements for each material will be stressed throughout.

Repair configuration types and their bond integrity will be outlined. Delegates will be shown the signs and effect of bonding deficiencies associated with a variety of repair processes.

The difference between wet and prepreg repairs and the SRM rules of proximity by aircraft type will be discussed and illustrated. Delegates will find out how to decide which system is appropriate to a given repair situation and the impact the choice can have on final finish. Delegates will be asked to assess the required proximity of repairs and the impact of incorrect spacing.

Levels of repair will be discussed: cosmetic, temporary, interim and permanent. The various aircraft manufacturers' attitudes to each type of repair will be dealt with. Advice on how to decide which level of repair to use will be given.

This section will involve extensive use of SRMs.

Delegates will be taken through the methods of removing damage and paint surfaces using mechanical and chemical methods and the issues associated with both. The impact of mesh substrates and monolithic substrates will be discussed.

Methods of assessing damage impact prior to and after repair will be considered with reference to the relevant SRM's and the impact this has on subsequent paint finishing. Delegates will be shown the common types of damage encountered in composite components, followed by a discussion of the best repair strategy to adopt for each damage type.

After a brief introduction to the vacuum bagging methods, Delegates will be shown the signs of incorrect vacuum bagging and the effect on repair quality and integrity this has. This will be discussed in association with the common faults associated with hot bonder failure/deviation from SRM requirement.

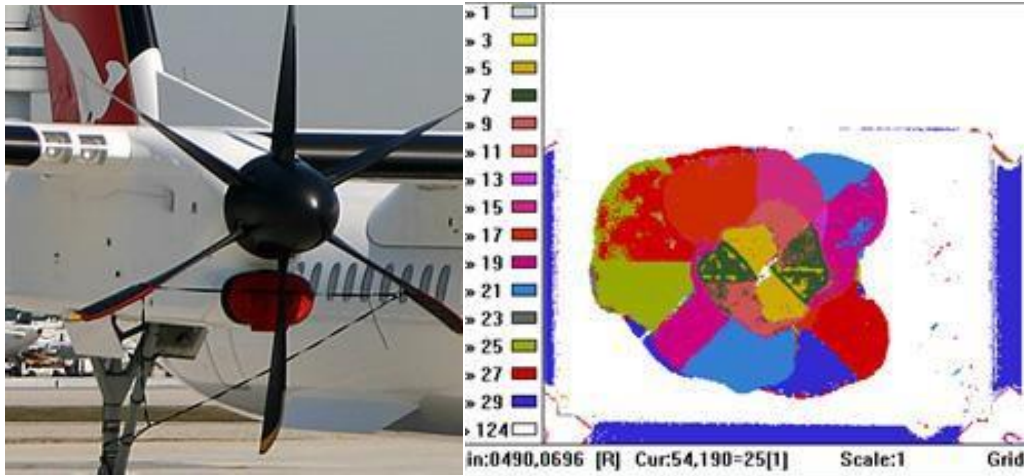
Demonstration of bond failure will be shown and the level of damage that can be caused by inappropriate repair techniques and procedures and the impact this has on inspection and repair integrity prior to paint preparation and after painting.

Acceptable and unacceptable defects alongside allowable repair site sanding in preparation for painting will be identified.

Inspection intervals and requirements for different repair types and accepted inspection techniques by aircraft type will be illustrated, Delegates will be given an exercise to identify the appropriate techniques/types using SRMs.

Restrictions on repair methods will be discussed in relation to the above.

An overview of the NDT techniques for composite repairs will be given with demonstration of simple methods available.



Demonstration will be used to illustrate good and bad repair and the characteristics associated with both.

Delegates will be asked to define how they would address specific surface imperfections prior to painting and the techniques they would use to address the imperfections.

Good and poor paint surface finishes and their implications on fuel economy and longevity will be reviewed and discussed.

SRMs will be used throughout with a view to understanding how to extract the large amount of information that is necessary for each repair

Delegates will be shown common mistakes in repairs, so that they can judge the best way to inspect a repair for integrity.

After recommendations relating to the importance of reporting and record keeping for repair life cycle management the delegates will be asked to identify procedures and actions required for the reporting of SRM repair non-compliance. The responsibilities of releasing the aircraft back into service will be reviewed.

Delegates will be presented with a case study to use SRMs to identify factors relevant to inspection and correct procedures prior to and following painting.

The course will be summarised, and delegates will be given a chance to evaluate it.



**Course Title: Metal to Metal Bonding**

**Course Code: ACM01**

**Duration: 5 Days**

**Course structure: 20% theory, 80% practical**

**Who is it for:** This course is intended for those members of staff who will be carrying out bonded repairs on metallic aircraft structures. It will give them sufficient knowledge to be able to complete the repair to approved aerospace standards. No previous knowledge required.

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### **Course content**

The emphasis of the course is on developing the practical skills necessary to carry out metal-to-metal bonded repairs on metallic structures in accordance with published manufacturers' structural repair manuals. The theoretical content allows the delegate to produce quality repairs using the correct materials and procedures and to work safely.

The techniques used are those currently recommended in manufacturers' structural repair manuals and emphasis will be placed on strict adherence to these procedures. The importance of quality assurance is stressed through-out with particular attention paid to quality control by adopting good practices throughout the repair procedure.

The course content has been devised to convey the latest accepted techniques for metal-to-metal bonding.

### **The course aims:**

- To familiarise the delegate with the materials and techniques used to repair metallic structures using bonding techniques.
- To provide the delegate with the knowledge to satisfy the appropriate health and safety requirements.
- To equip the delegate with the knowledge and practical skills required to carry out sound and effective repairs on metallic aircraft components, according to the methods recommended and accepted by the aircraft manufacturers.
- To provide the delegate with the skills necessary to carry out surface anodising using the phosphoric acid non-tank method (POANTA).
- To introduce the delegate to the phosphoric acid containment system (PACS) for aluminium anodising as specified by Boeing.
- To provide the delegate with the skills necessary to carry out the sol-gel (Boegel) process for aluminium conversion as specified by Boeing.
- To provide the knowledge required to interpret standard structural repair manuals and to relate them to a given repair situation.
- To satisfy all the relevant quality assurance requirements.

**The course covers:**

Delegates will be introduced to the fundamentals of metal to metal bonding and the reasons that it is becoming more widely used and adopted.

The safe and correct use of epoxy resins will be covered along with vacuum hot bonded cure. Delegates will learn the correct methods of bagging up repairs and programming cure cycles. Health and safety issues will be addressed throughout.

The reasons for surface anodising will be addressed, delegates will utilise various surface preparation methods for surface anodising. They will have the opportunity to anodise with a combination of tank and non-tank (PANTA) anodising methods along with the effective use of Sol-gel (Boegel) process for aluminium conversion as specified by Boeing.

An introduction to the use of film adhesives will be followed by practice in the use of effective vacuum hot bonding.

Delegates will be shown how to assess the success of the anodising process using reflected polarised light.

The poultice method of PANTA will be demonstrated and the delegates will carry out metal-to-metal bonding using the poultice PANTA method and a hot bonded film adhesive cure.

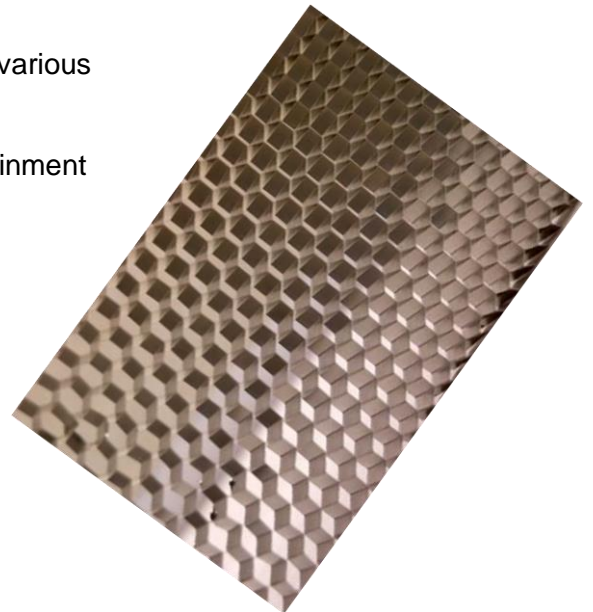
The relevant sections of manufacturers' structural repair manuals relating to metallic repairs will be analysed in detail.

Delegates will be introduced to the sol-gel (Boegel) surface conversion method for preparing aluminium alloys for bonding.

Delegates will perform a metal bonded repair on a metal skinned honeycomb cored component using the SRM and appropriate techniques. Delegates will perform dent and crack evaluation and repairs, they will also perform skin repairs and a variety of core repairs both single sided and through penetrating.

Continuation of component repair and comparison of the various manufacturers' repair methods.

Delegates will be introduced to the phosphoric acid containment system (PACS) for surface anodising.





**Course Title: Metal to Metal Bonding 2**

**Course Code: ACM02**

**Duration: 5 Days**

**Pre-requisite: ACM01 Metal to Metal Bonding 1**

**Course structure: 20% theory, 80% practical**

**Who is it for:** This progression course is intended for those members of staff who will be carrying out bonded repairs on metallic aircraft structures. It will give them sufficient knowledge to be able to complete the repair to approved aerospace standards together with completing repairs which are outside the SRM, enabling the repair of damage which has occurred to an existing repair. Delegates will have completed ACM01 Metal to Metal Bonding 1 prior to commencing the course.

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### **Course content**

This course is designed to address metal to metal and metal to composite bonded repairs. The repairs addressed will be within the boundaries of the structural repair manuals (SRM)s and will address the procedures to take and how to complete repairs which are outside the SRM requirements. Familiarization and compliance to such procedures is the central focus to equip the technician with the skills to perform repairs utilising good practice bonding methodologies.

Various damage scenarios will be presented including, but not limited to, damage to: edge/s, corner, bolted locations with the application of repair triple septons. Delegates will also be introduced to the practices and methods to use when dealing with repairs to areas which have an existing repair and addressing and/or restoring unsuccessful damage repairs.

The emphasis of the course is on developing the practical skills necessary to carry out metal-to-metal and metal-to-composite bonded repairs on metallic structures in accordance with published manufacturers' structural repair manuals. The theoretical content allows the delegate to produce quality repairs using the correct materials and procedures and to work safely.

The techniques used are those currently recommended in manufacturers' structural repair manuals and emphasis will be placed on strict adherence to these procedures. The importance of quality assurance is stressed through-out with particular attention paid to quality control by adopting good practices throughout the repair procedure. The course content has been devised to convey the latest accepted techniques for metal-to-metal and metal-to-composite bonding.

### **The course aims to:**

- To provide delegates with the knowledge and confidence to undertake challenging repairs they will encounter.
- To provide the delegate with the knowledge to satisfy the appropriate health and safety requirements for processes and material used in repair.

- To enable delegates to identify the correct materials, techniques, tooling and equipment to utilise for a given situation.
- To equip the delegate with the knowledge and practical skills required to carry out sound and effective repairs on metallic aircraft components, according to the methods recommended and accepted by the aircraft manufacturers.
- To provide the delegate with the skills necessary to carry out effective surface anodising using a combination of anodising techniques.
- To provide the knowledge required to interpret standard structural repair manuals and to relate them to a given repair situation and when required implement successfully repairs which have been defined outside repair allowable.
- To satisfy all the relevant quality assurance and NDT requirements.

### **The course covers:**

Delegates will be introduced to the required methods of progressive repair utilising a variety of bonding metals and core densities based upon effective thermal balance to implement a series of progressively changing repairs.

Delegates will undertake structural repair to cellular systems on both aircraft structures and decking.

Delegates will have the opportunity to repair a corner and a leading edge.

Delegates will perform a variety of repairs septum repairs to cores and critical areas where a load platform exists which result in a triple septum repair.

Delegates will repair an unsuccessful structural repair and consider the implications of repair proximity.

Core Filling using paste techniques and edge band techniques will be demonstrated. Delegates will learn the correct methods of bagging up repairs and programming cure cycles.

Health and safety issues will be addressed. Various surface preparation methods will be investigated.

Delegates will be shown how to assess the success of the anodising process. The issues of bonding aluminium honeycombs to a composite skin together with a repair will be reviewed on sandwich panels with and without acoustic inclusion.

The delegates are encouraged to take our hotbonder certification course as required by the CAA. However, we will provide knowledge of hotbonder use for repairs on the course and the safe handling of materials utilised, along with vacuum hot bonded and oven cure and associated procedures.

We are also happy to either introduce specific customer repairs or components into this course or convert its structure to a bespoke course to match the needs of our customer, by prior discussion.

## 787 Structural Composite Repair Course Overview

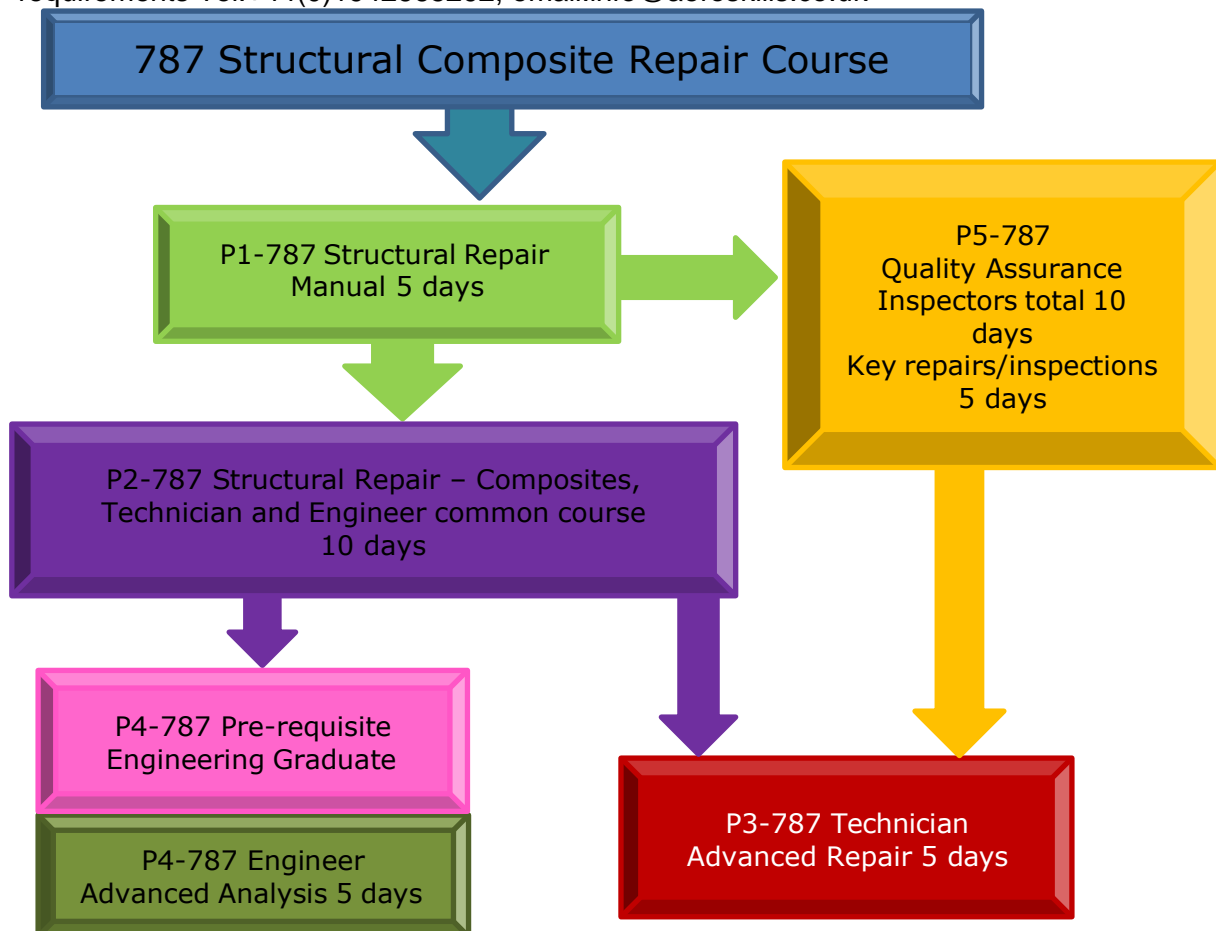
The 787 aircraft has extensive use of composite structures, when damaged they require new and specific 787 composite repair procedures, which vary from other aircraft types and is compatible with the Boeing 787 specification for structural composite repair training.

The course is designed for engineers, technicians and quality assurance inspectors to provide structural composite repair knowledge to enable them to effectively undertake compliant activities within their work role. This is achieved through specific 787 training, starting with the mandatory 787 SRM training course, followed by training related to the delegates assigned responsibilities to validate their licence approval.

The 787 technicians course provides extensive practical structural composite repair training, the 787 engineers course embraces practical and theoretical calculations to assist a design authority to specify a repair that is outside the SRM parameters, while the quality assurance inspectors course provides both practical and inspection knowledge to verify the compliance of 787 structural composite repairs.

Our cost effective dedicated 787 composite repair courses are design to fully comply with Boeing requirements for the 787 technician, 787 engineer and 787 quality assurance inspectors to attain competence in their respective work roles. We continually strive towards training improvements through documentary tracking and especially the delegate requirements.

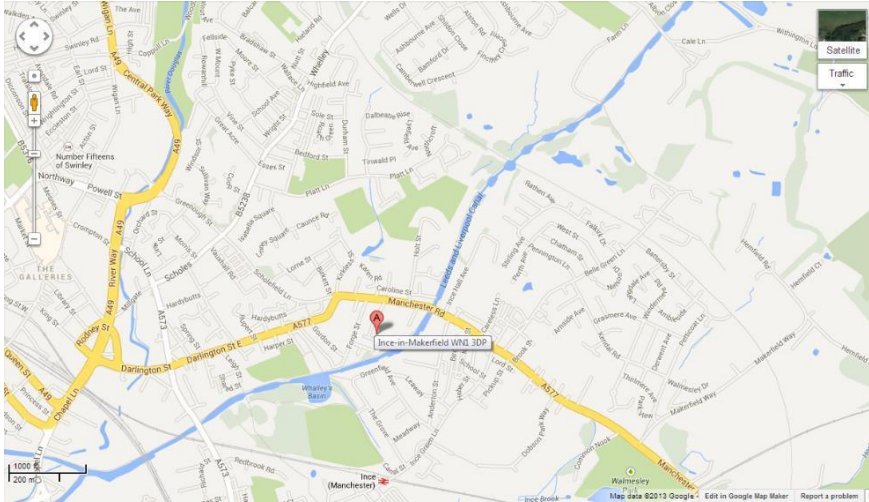
Those delegates who undertake repairs to other aircraft types and manufactures are advised to undertake our general aircraft courses found at [www.Aeroskills.co.uk](http://www.Aeroskills.co.uk) or contact to discuss your requirements Tel:+44(0)1942665292, email:[info@aeroskills.co.uk](mailto:info@aeroskills.co.uk)



Please contact for details of our specialist 787 courses  
Tel:01942 665292 Email: [info@aeroskills.co.uk](mailto:info@aeroskills.co.uk)

## Location and contact details

We are located within 1 mile of Wigan town centre and 22 miles from central Manchester.



### By Car

We are located close to the main M6 motorway for north and south bound carriageways. From Manchester we are off the M61 at junction 5. Follow signs for Wigan when leaving the motorways.

North Composites Engineering Ltd  
Unit 8 Rosebridge Court  
Rosebridge Way  
Ince  
Wigan

### Sat Nav location

WN1 3DP

### Rail Link

We are easily accessed by rail link with Wigan North Western and Wigan Wallgate stations are only 1.8 miles away and Ince rail station is 0.7 of a mile away all have links to Manchester Piccadilly Station.

### Contact Details

For further details of our other courses and service or to reserve a place please contact us on:

**Phone:** +44(0)1942 665292

**Email:** info@aeroskills.co.uk





**Hotels and accommodation close to North Composites Engineering.**

**Premier Inn Wigan Town Centre**

Harrogate Street,  
Wigan, WN1 1BL

Contacts

T: 0871 527 9502

F: 0871 527 9503

Part of the premier inn group, approx. 2.4 miles to NCE

**Premier Inn Wigan**

Warrington Road,  
Marus Bridge,

Wigan,  
WN3 6XB

Contacts

Tel: 0871 527 9164

Fax: 0871 527 9165

Part of the premier inn group, approx. 3.1 miles to NCE.

<http://www.premierinn.com>