SWAGE AERO

COURSE ATS-PSW-01
FORMAT 1-DAY PROGRAMME
STANDARDS SAE AS5902 / AS4459
BROCHURE ENGLISH

SWAGE AERO TRAINING PROGRAMME

# SWAGE MASTERY.

The complete one-day programme for technicians installing permanent tube connections in aircraft hydraulic systems — from preparation to certified installation.

STANDARDS ALIGNED

SAE AS5902 · AS4459

INSTALLATION OF EXTERNALLY SWAGED FITTINGS
SAE AEROSPACE STANDARDS

DETAILED COURSE OUTLINE
AIRCRAFT HYDRAULIC SYSTEMS · PERMANENT TUBE CONNECTIONS

swageaero.com

SCOPE & PURPOSE

# BUILD TECHNICIANS WHO GET IT RIGHT THE FIRST TIME.

This programme delivers in-depth, hands-on training in the installation of **permanent tube connections** using swage technology in aircraft hydraulic systems. Participants gain a complete working understanding of swaging principles and the full range of fittings used across modern aerospace platforms.

From tubing preparation and witness marking through installation, Go/No-Go gauge inspection and root-cause analysis of failed assemblies, every step is covered — the way it is performed in the field, and the way the relevant aerospace standards expect it to be performed. Theory is paired with practical exercises so participants leave with the muscle memory and the confidence to perform reliable, certifiable connections.

Throughout the day we maintain a strong focus on **safety, FOD prevention, correct tool handling and adherence to manufacturer guidelines**. On completion, participants are equipped to perform swage installations on hydraulic systems with the integrity these critical components demand.

COURSE AT A GLANCE

## Specifications.

| | |
|---|---|
| COURSE ID | ATS-PSW-01 |
| TITLE | Swage Installation |
| TAG | Swage Training |
| DURATION | 1 working day · 8 h |
| CLASSROOM | 3.5 hours |
| PRACTICAL | 4.5 hours |
| STANDARDS | SAE AS5902 · AS4459 |
| PREREQUISITE | Basic hydraulics |
| GROUP SIZE | Up to 8 trainees |
| LANGUAGE | English |

SIX MODULES · ONE DAY

# FROM PRINCIPLE TO PRODUCTION-GRADE INSTALL.

Each module is built around the practical realities of working on a hangar floor. Theory is kept tight; tool time is generous. The structure escalates — the first hours establish the why and the how, the afternoon turns it into skill.

### 01
**INTRODUCTION TO SWAGE TECHNOLOGY**

Principles, applications and material compatibility for aerospace tube/fitting combinations.

### 02
**TUBING PREPARATION & WITNESS MARKING**

Cutting, deburring, cleaning, witness marking and FOD-controlled practice.

### 03
**SWAGE FITTING INSTALLATION**

Step-by-step installation, serialised tooling, OEM / SRM / CMM navigation.

### 04
**SAFETY & FOD PREVENTION**

PPE, safe tool handling, FOD prevention, hazardous materials, compliance.

### 05
**INSPECTION, DEFECTS & ROOT CAUSE**

Go/No-Go gauges, defect identification, root-cause analysis, traceability.

### 06
**HANDS-ON SWAGE EXERCISES**

Real tools, real fittings, real gauges — supervised end-to-end practice.

## DAY SCHEDULE

TOTAL · 8 HOURS

| # | MODULE | LEVEL | CLASSROOM | PRACTICAL |
|---|---|---|---|---|
| 01 | **Introduction to Swage Technology** | L1 | 0.5 h | – |
| 02 | **Tubing Preparation & Witness Marking** | L1 | 0.5 h | – |
| 03 | **Swage Fitting Installation** | L1 | 1.0 h | – |
| 04 | **Safety & FOD Prevention** | L1 | 0.5 h | – |
| 05 | **Inspection, Defects & Root Cause** | L1 | 1.0 h | – |
| 06 | **Hands-On Swage Exercises** | L3 | – | 4.5 h |
| | **TOTAL HOURS** | | **3.5 H** | **4.5 H** |

# MODULES 01 · 02 · 03

FOUNDATION & INSTALLATION

01
MODULE ONE

## INTRODUCTION TO SWAGE TECHNOLOGY

Participants are introduced to swage technology and its applications in aircraft hydraulic systems. The module covers the fundamental principles of swaging, the benefits and types of fittings, the tooling, and — critically — **material compatibility** across the most common aerospace tube and fitting combinations. This is the foundation everything else rests on.

**TOPICS**

- Principles of swaging
- Benefits of swage technology
- Applications in aircraft hydraulic systems
- Types of swage fittings
- Tube/fitting material compatibility — Ti, 21-6-9, 304 SS, 6061-T6 Al
- Pressure class and wall thickness considerations

**ON COMPLETION**

- Understand the basic principles of swaging
- Identify the benefits and applications of swage technology
- Recognise different types of swage fittings
- Match fittings to compatible tube materials and pressure classes
- Become familiar with the tools and equipment used in the process

02
MODULE TWO

## TUBING PREPARATION & WITNESS MARKING

Proper tubing preparation is the difference between a connection that holds and one that fails. This module covers cutting, deburring, cleaning and inspection — alongside **tube insertion depth, witness marking and FOD prevention**. Precision and cleanliness are treated as non-negotiable, because any imperfection on the tube or any particle in the system compromises the integrity of the swaged connection.

**TOPICS**

- Cutting and deburring techniques
- Cleaning, inspection and FOD / contamination control
- Tube insertion depth and witness marking
- Contamination-safe marking methods
- Common preparation issues and remedies
- Tools and equipment for tubing preparation

**ON COMPLETION**

- Understand the steps involved in tubing preparation
- Apply correct cutting, deburring and cleaning techniques
- Apply witness marking for insertion-depth verification
- Maintain FOD-free, contamination-controlled conditions
- Identify common issues and the correct remedies

03
MODULE THREE

## SWAGE FITTING INSTALLATION

The core procedural module. Participants learn the step-by-step process of installing swage fittings: correct use of swaging tools, **serialised die matching, damaged-die identification and tooling calibration awareness**, plus how to navigate **OEM, SRM and CMM documentation** to find the data the job demands — all anchored in manufacturer guidelines and industry standards.

**TOPICS**

- Step-by-step installation process
- Use of swaging tools and equipment
- Serialised die matching & damaged-die identification
- Tooling calibration and pressure-verification awareness
- Navigating OEM documentation, SRM and CMM references
- Manufacturer guidelines and industry standards

**ON COMPLETION**

- Execute the full swage installation process
- Use swaging tools and equipment correctly
- Identify mismatched, damaged or out-of-calibration tooling
- Locate and apply the correct OEM installation data
- Achieve secure, leak-free connections to OEM standard

# MODULES 04 · 05 · 06

SAFETY, QUALITY & PRACTICE

04
MODULE FOUR

## SAFETY & FOD PREVENTION

Safety is treated as a discipline, not a checklist. Participants cover personal protective equipment, the safe handling of tools and equipment, **FOD prevention and hydraulic system cleanliness**, and a controlled workspace — alongside the handling of hazardous materials and compliance with relevant industry safety regulations.

**TOPICS**

- Personal Protective Equipment (PPE)
- Safe handling of tools and equipment
- FOD prevention and hydraulic system cleanliness
- Workspace safety measures
- Handling and storage of hazardous materials
- Health hazards and prevention
- Compliance with industry safety regulations

**ON COMPLETION**

- Apply correct PPE and safe-handling practices
- Maintain a clean, controlled and FOD-free workspace
- Recognise and mitigate health hazards on the job
- Work in alignment with industry safety regulations

05
MODULE FIVE

## INSPECTION, DEFECTS & ROOT CAUSE

A swage that looks fine isn't always fine. Participants learn **Go/No-Go gauge inspection** — verifying both swaged diameter and swaged length — gauge acceptance criteria and re-swage rules, witness-mark verification after swaging, and the typical installation defects that show up in the field. We then walk through **root-cause analysis** on real failure patterns, plus a working awareness of pressure and leak testing — and the documentation that supports traceability.

**TOPICS**

- Go/No-Go gauge inspection — diameter & length
- Gauge acceptance and re-swage criteria
- Witness-mark verification after swaging
- Common defects: under-swage, over-swage, scoring, contamination, misalignment
- Root-cause analysis of failed swaged assemblies
- Pressure and leak-testing awareness
- Documentation and traceability

**ON COMPLETION**

- Perform Go/No-Go gauge verification on swaged connections
- Apply inspection criteria including witness-mark verification
- Identify and classify common installation defects
- Conduct basic root-cause analysis on failed assemblies
- Understand pressure and leak testing principles
- Implement documentation and record-keeping practices

06
MODULE SIX

## HANDS-ON SWAGE EXERCISES

The afternoon. Real tools, real fittings, real gauges — supervised practice from end to end. Participants apply everything covered earlier in the day: tubing preparation, witness marking, installation, **Go/No-Go gauge inspection** and a defect-identification walk-through with direct instructor feedback. The goal is the muscle memory needed to do this on a real aircraft, the day after the course.

**TOPICS**

- Practical tubing preparation and witness marking
- Hands-on installation of swage fittings
- Go/No-Go gauge inspection practice
- Defect identification and root-cause walkthrough
- Review and feedback on hands-on exercises

**ON COMPLETION**

- Prepare tubing to spec, including witness marking
- Install swage fittings using correct technique
- Perform Go/No-Go gauge inspections in practice
- Identify and classify defects on bench samples
- Demonstrate confidence and proficiency with the tooling

TRAINED BY THE PEOPLE WHO SUPPLY THE TOOLS

# NOT JUST THEORY. THE WHOLE CRAFT.

Swage Aero supplies aerospace professionals worldwide with permanent radial swage toolkits, internal swage tooling and the consumables that go with them. We train the way we equip — for technicians who will use this on real aircraft, the day after the course.

| 8h | 6 | 4.5h | L3 |
|---|---|---|---|
| ONE FOCUSED WORKING DAY | MODULES · THEORY TO HANDS-ON | PRACTICAL TOOL TIME ON THE BENCH | HIGHEST PRACTICAL TEACHING LEVEL |

## WHAT YOU WALK AWAY WITH

01 **WORKING KNOWLEDGE OF SWAGING**

The principles, applications and fitting types — not as trivia but as the framework you reach for when something on the tube does not look right.

02 **TOOL FLUENCY**

Confident, correct use of swaging tools and equipment — the kind of fluency that only comes from supervised hands-on practice.

03 **INSTALLATION DISCIPLINE**

A repeatable installation routine grounded in OEM, SRM and CMM documentation — with serialised tooling and calibration awareness built in.

04 **INSPECTION & ROOT-CAUSE EYE**

Go/No-Go gauge verification, defect classification, and the judgement to call a connection right — or call it back.

SWAGE AERO

BOOK YOUR SEAT

NEXT INTAKE ON REQUEST

# TRAIN THE TECHNICIANS WHO NEVER MISS.

One day. Six modules. Real tooling. Witness marking. Go/No-Go inspection. swage installations done the way OEM standards demand — built into your team's muscle memory.

RESERVE A COURSE →


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