ESA-Approved Skills Certification Requirements

Electronic Assembly Domain

Abstract

This document describes the various activities that skills certification centres undergo to gain and maintain an ESA approval for the certification of electronic assembly operators, inspectors and instructors. The certification courses are in accordance with the ECSS Q-Standards for electronic assembly and processes used for European space projects. Outlines of the course contents are given and the tools needed for these manufacturing processes are described. The courses also provide a basic understanding of the use of materials in the space environment.

The report also harmonises the approach and technical content of the various certification courses offered by ESA-approved skills certification schools, the types of certification awarded to successful candidates, and the means of progressing or retaining their certified status. In-house training organisation for the training and certification of operators and inspectors within suppliers' premises is also described.

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1. Introduction

As part of its activities to promote, improve and maintain the quality of work within the space industry, the Mechanical Department with the support of the Product Assurance and Safety Department operates a scheme for the approval of centres to certify operators, inspectors and instructors in electronic assembly in accordance with ECSS standards. Manufacturing and assembly methods applied within the space industry for spacecraft electronics are detailed in the various process specifications cited herein.

In developing skills certification centres, ESA's goals are to:
1. Develop a pool of personnel trained by their employers in best practices for electronic assembly
2. Develop a network of organisations capable of providing certification to appropriate standards
3. Improve the quality of electronic assemblies used in space projects

These goals are achieved by:
1. Provision of high-quality certification in electronic assembly techniques at ESA-approved certification centres
2. Assurance that operators, inspectors and instructors obtain a level of technical knowledge and experience through training by their employers to enable certification
3. Harmonisation of the general policies between centres, notably courses and examinations, by means of the ESA annual certification centres meeting
4. Continued monitoring, assessment and audit of approved centres by an ESA-nominated manager

The ESA certification progression schematic does not substitute the internal training and qualification that shall be operated by the Companies (employers) but is considered as a complement. As indicated in Figure 5.1 all attendees shall have adequate experience to be entitled to participate in an ESA skills certification course.

2. Scope

This document describes the various activities necessary to become and maintain an ESA-approved skills certification centre for the certification of electronic assembly operators, inspectors and instructors in accordance with the applied standards and process specifications cited herein.

The document also describes the activities necessary to become and maintain an in-house training organisation for the training, qualification that may lead to ESA certification by an ESA certification centre, and, re-certification of operators and inspectors within suppliers' premises.

The document identifies means of retaining certification status of personnel and of potentially progressing through certification categories.

3. Abbreviations

CAT   Category
ECSS   European Cooperation for Space Standardization
ESA   European Space Agency
ESTEC   European Space Research and Technology Centre
MIP   Mandatory Inspection Point
NCR   Non-Conformance Report
PCB   Printed Circuit Board
SMC   Surface Mount Components
VA   Visual Acuity

4. Related Documents

Skills Certification Centres establish and maintain an effective written programme to certify and recertify all personnel performing any operations described in one or more of the standards and process specifications listed in Table 4.1. ECSS standards are available for download at the ECSS website (http://www.ecss.nl/).

Always establish that the version of a standard or process specification is the most recent issue.

ECSS-Q-ST-70-07	Verification and approval of automatic machine wave soldering
ECSS-Q-ST-70-08	The manual soldering of high-reliability electrical connections
ECSS-Q-ST-70-18	The preparation, assembly and mounting of RF coaxial cables
ECSS-Q-ST-70-26	The crimping of high-reliability electrical connections
ECSS-Q-ST-70-28	The repair and modification of printed-circuit boards and solder joints for space use
ECSS-Q-ST-70-30	The wire wrapping of high-reliability electrical connections
ECSS-Q-ST-70-38	High-reliability soldering for surface-mount and mixed-technology printed circuit-boards

Table 4.1 – Electronic assembly standards

5. Skills Certification Scheme

5.1   Approval

The ESA-nominated manager has the final authority for granting, extending, reducing or removing the approval status of a skills certification centre or an in-house training/re-certification Instructor.

5.2   Skills Certification

5.2.1   ESA Approved Skills Certification Centres

To be granted or maintain the ESA-approved status, each certification centre shall fulfil the following:
1. Pass the initial assessment or audit (see Annex 1).
2. Make available staff credentials and centre records for internal audit.
3. Submit customer feedback results.
4. Make available student records (see section 5.5)
5. Submit the list of waivers issued.
6. Describe corrective action to resolve any non-conformances.
7. Maintain resources, facilities, records and provision of certification.

5.2.2   In-house Training/re-certification Instructor

To be granted or maintain an in-house training Instructor, a company shall fulfil the following:
1. Pass the audit (see Annex 1)
2. Make available staff credentials and school records for internal audit.
3. Submit an outline for each skills training course that may lead to ESA certification by an ESA-approved Certification Centre
4. Submit an outline for each re-certification course that meets ESA's requirements (see Annexes 3 to 9).
5. Describe corrective action to resolve any non-conformances.
6. Maintain resources, facilities, records and provision of training.

5.3   Certification: Categories and Personnel

5.3.1   Categories

Three types of certification are awarded by the skills certification schools, as given in Table 5.1.

Category	Title	Conditions of award [†]
Category 1	Instructor	Certificate shall only be issued by ESA-approved skills certification centre and co-signed by ESA
Category 2	Inspector	First certificate shall only be issued by the ESA-approved certification centre. Re-certification can be undertaken by either an ESA-approved certification centre or by an in-house training/certification instructor who has been certified according to Category 1 (see above).
Category 3	Operator	First certificate shall only be issued by the ESA-approved certification centre. Re-certification can be undertaken by either an ESA-approved certification centre or by an in-house training/certification instructor who has been certified according to Category 1 (see above).
[†] See 5.9 for list of ESA-approved skills certification centres		

Table 5.1 – Certification: categories and conditions of award

5.3.2   Certificates

Each certification centre or in-house training certified Cat 1 instructor issues certificates (See Annex 2 for an example of a certificate) in two formats which are standardised across certification centres or in-house training schools:

1. full A4 page size for display purposes.
2. 'credit card' size, carried by certified personnel to enable identification at the place of work
3. In-house certificates must not carry ESA logo.
4. Certificates shall have a serial number.

ESA suppliers shall keep certificates of their personnel in an auditable manner.

When operators are certified to perform limited operations or processes, it is stated on the certificate, along with all associated certification records.

Each certificate is approved by the signature of the Certification Centre Manager or Category 1 Instructor (whether in the centre or in-house training certified Cat 1 instructor). Category 1 Certificates issued by ESA certification centres shall be countersigned by ESA Mechanical Department and Product Assurance and Safety Department.

Certificates are valid for a period of two years (see also 5.7). The issue and expiry dates are shown on the certificate. A new certificate shall be issued after successful re-certification.

5.3.3   Certified Personnel

The initial certification of every operator and inspector shall be undertaken at one of the approved centres (see 5.9). Re-certification can be performed either at an ESA-approved certification centre or by an in-house ESA-certified Category 1 instructor.

In-house Category 1 personnel are responsible for the training and re-certification of Category 2 and Category 3 personnel, but shall not certify them for the first time. Training records shall be maintained by Category 1 instructors as required in 5.5.

In-house Category 1 personnel of an ESA supplier shall train and re-certify only their own employees and contractors, and not those of any outsourcing organisation.

In house Category 1 personnel of an ESA supplier may train and re-certify employees from outsourcing organisation providing they obtain approval from ESA.

ESA-approved skills certification centres' Category 1 personnel can train, certify and re-certify Category 1, Category 2 and Category 3 personnel.

Certified Category 2 and Category 3 personnel perform inspections and processing operations respectively, at the site of the company they are employed by and from which they had an internal training and qualification prior to participate to ESA skills certification centre.

Personnel certified by an ESA-approved skills certification centre may maintain their certification status even if / when they change employer providing authorization from ESA.

In-house certified personnel do not maintain their certification status if / when they change employer.

Suppliers which provide in-house training/certification for the re-certification of inspectors and operators, have at least one Category 1 instructor for each of the processes used by the supplier (see 4 – Related Documents).

5.3.4   Progression of Certified Personnel

Figure 5.1 shows the possible progression route for certification of personnel. All personnel undergo operator training (Cat 3) prior to potentially advancing to inspector level (Cat2) and instructor (Cat 1) level. The certification progression structure shows the possible developments, over a sustained period of time, of the skills, standards and categories. The minimum times between categories are only that and not an expectation that personnel would be pushed through stages at that rate.
The progression routes exist to allow ESA suppliers to grow and upskill their workforce as required.
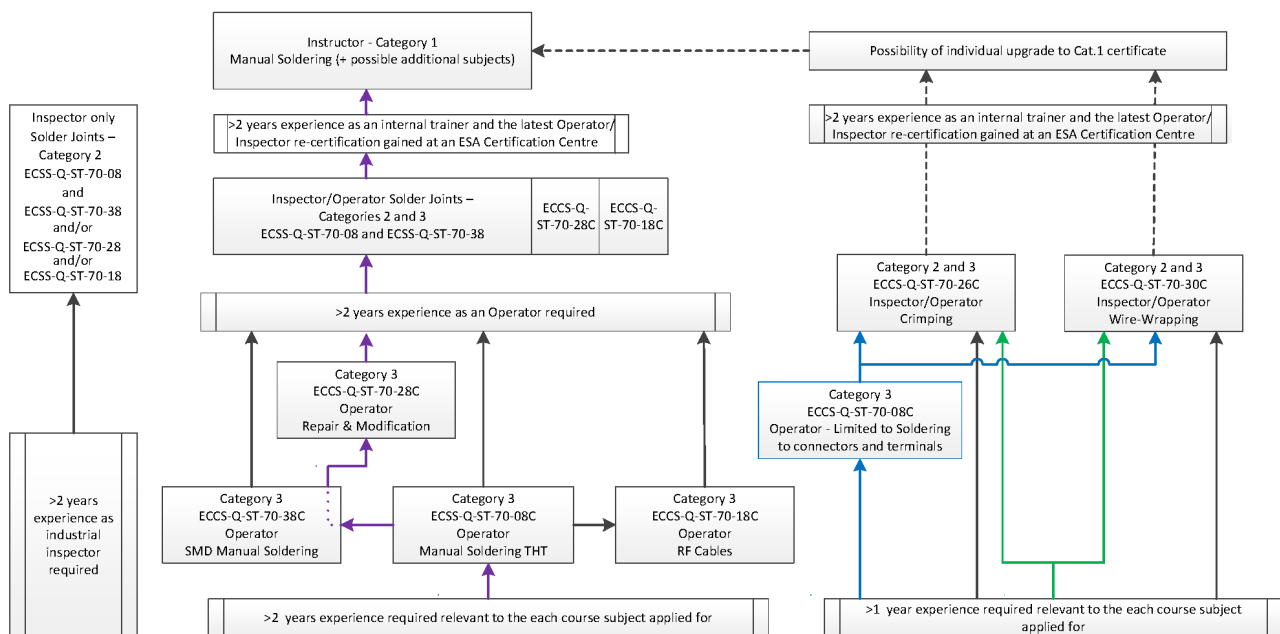
Figure 5.1 – ESA certification Structure –progression routes for certification

A person shall have a minimum of two years full time equivalent experience and be fully trained by their employer in the relevant processes and job role before being admitted on an ESA-approved certification course with the exception for the ECSS-Q-ST-70-30 and '-26 certification. When such requirement may be detrimental to business continuity, a waiver system is in place. Please see Annex 10 for an example of a request for a waiver (RFW).

In all cases, whether any requirements have been waived or not, a person attending an ESA-approved skills certification course will only receive an ESA certification if they pass both the theoretical and practical examinations relevant to the standards that the courses are based on.
A person applying for Category 1 certification must have been working as an in-house trainer for at least two years and that status registered by ESA and have their latest Cat 2/3 certificate issued by an ESA-approved skills certification centre.

5.4   Visual Acuity

All candidates shall meet the visual acuity (VA) requirements:
1. Near vision: JAEGER 1 or 0.50 mm letters at 35.5 cm or better
2. Colour perception: Normal as determined by means of standard colour plates. i.e. Dvorine pseudo-isochromatic plates, Ishihara plates or equivalent.

Employers shall hold visual acuity forms for all their ESA certified personnel and confirm (by way of a signature of the applicant's manager) that they meet the requirements at the time of the application for a course.

5.5   Training/Certification Records

The certification centres' or in-house training cat 1 instructor's training/certification records shall be maintained for four years (two most recent training/certification cycles).

The certification records, for each course attendee, shall comprise:
1. Trainee fabricated test specimens depicting satisfactory conformance to the applicable process specification.
2. The marked written test papers
3. Details of the employer and employer's address
4. Certification Category, with any restrictions clearly noted
5. Date of certification or re-certification
6. Completed and employer-countersigned application form, including any waivers, that also shows that the visual acuity requirements are met (see 5.4).

Note: Requirements 4 and 5 may be met by keeping a copy of the certificates issued.

5.6   Certification Programme Evaluation

The certification programme, the associated skills-training and/or certification facilities, training/certification records and the trainee practical test are reviewed by ESA to assure that each programme is compatible with the relevant standard or process specification (see Annexes 3 to 9 for details of each certification course outline).

Approval of a certification programme can be withdrawn at any time in the event of a non-conformance.

5.7   Maintenance of Certified Status and Recertification

Instructors, inspectors and operators need to demonstrate continuous proficiency and a high standard of workmanship in order to maintain their status of certification. This is demonstrated by re-certification every two years.

Re-certification of operator and inspector personnel is undertaken as follows:
1. Re-certification courses should be booked six months before the certification end-date to avoid lapse in certification.
2. Re-certification shall be undertaken every two years (unless specific and unavoidable circumstances apply).
3. If less than two years since last certification, personnel may attend a re-certification course to have their certification granted for a further two years. Personnel may attend a recertification course up to six months before their certification end date and maintain their anniversary of certification.

4. If there is no mutual availability for a re-certification course, personnel shall ask ESA Centre for an extension of their certificate originally issued by an ESA Centre. The extension may be up to six months to cover the gap between the certification end date and the booked course date. The original anniversary of certification will be maintained.

   Note 1: This option is not available for in-house certification.

   Note 2: If a person's certificate ends in September of 201x, and they get an extension of up to six months, attend a re-certification course no later than March of 201x+1, their new certificate will expire in September 201x+2.

   Note 3: The scanned version of the original certificate will be stamped with the following statement "This certificate is extended from end of xxx until end of yyy in accordance with the ESA STR258 para. 5.7.4".

   Note 4: The extension can be provided only by the ESA schools that has issued the original certificate.

5. After certification end-date, there is a two years lapse period where re-certifications can be taken. In this lapse period the person is no longer authorized to work on ESA projects. If the lapse period is in excess of two years, then the full certification course has to be attended.

6. Operator and inspector personnel experience a work-period interruption of greater than nine months (responsibility of the employer).

7. Insufficient proficiency for a particular standard or process specification.

8. There is a reason to question proficiency of workmanship.

9. Development of new techniques that need new skills.

Instructors are certified and recertified as follows:

1. In-house training personnel gain their certification for Category 1 by attending a course at an ESA-approved skills certification centre approved for Category 1 certification (see Table 5.2).

2. ESA-approved skills certification centres' personnel gain their first Category 1 certification by attending a course at an ESA-approved skills certification centre.

3. Category 1 personnel shall be re-certified every two years.

4. If less than two years since last certification, personnel may attend a re-certification course to have their certification extended for a further two years. Personnel may attend a recertification course up to six months before their certification end date and maintain their anniversary of certification.

5. If there is no mutual availability for a re-certification course, personnel shall ask ESA Centre for an extension of their certificate. The extension may be up to six months to cover the gap between the certification end date and the booked course date. The original anniversary of certification will be maintained.

6. ESA skills certification centres Cat 1 shall recertify in an ESA skills certification centre different than the one they are working for or during a recertification session organised during the ESA Management skills certification annual meeting. The recertification during the Annual meeting is only possible for Cat 1 having passed already 2 re-certification in an ESA skills certification centre.

5.8   Withdrawal of Certified Status

It is the responsibility of the employers to invalidate the certifications in the following circumstances.

1. The certificate holder no longer meets the visual acuity requirements (see 5.4).
2. The quality of work does not meet the standard or process specification

3. There is a reason to question proficiency of workmanship.
4. Repetitive manufacturing defects.

5.9   Certification Sources

Table 5.2 lists ESA-approved skills certification centres. All ESA-approved skills certification centres can certify and re-certify Category 3 and Category 2 personnel. Category 1 certification and re-certification is only awarded by schools marked †. Re-certification of Category 2 and 3 personnel can also be accomplished through in-house training (see 5.3).
Courses in English are available at the schools marked *

The maximum number of attendees per certification course is limited to ten for ESA-approved certification centres. For in-house training/certification, the maximum of attendees per training/certification course is limited to six.

Country	ESA approved skills certification centre	Skills certification Manager contact
Denmark	Hytek * Sofievej 61 DK-9000 Aalborg	Tel. +45 9811 7003 Contact: Mr. P. Juul hytek@hytekaalborg.dk
France	Institut de Soudure (IS) Industrie ZI Paris Nord 2, 90, rue des Vanesses 93420 Villepinte	Tel. +33 (1) 49903622 Contact: Mr. P. Aloe P.Aloe@isgroupe.com
Germany	Institut für Elektronik (IFE) † * in dem Deutschen Zentrum für Luft und Raumfahrt, Münchener Str. 20, D-82234 Weßling / Oberpfaffenhofen	Tel. +49 (0) 8153 95 34594 Contact: Mr. L. Schöberle leo.schoeberle@ife-technology.de
Germany	Zentrum für Verbindungstechnik in der Elektronik (ZVE) † Fraunhofer Research Institution for Microsystems and Solid State Technologies EMFT, Argelsrieder Feld 6, D-82234 Weßling / Oberpfaffenhofen	Tel. +49 (0) 89 54759-456 Contact: Dr.-Ing. F. Ansorge frank.ansorge@emft.fraunhofer.de
Italy	IIS Progress srl †* Via Carlo Pisacane, 46 I-20025 Legnano MI	Tel. +39 (010) 8341315 or 83411 Contact: Mr. L. Moliterni luca.moliterni@iisprogress.it
Switzerland	Swiss Welding Institute (SWI) Rue du Nord 3 1400 Yverdon-les-Bains	Tel. +41 24 557 27 90 Contact: Mr. C. Benoit christian.benoit@swi.ch
UK	ASTA Technology UK Ltd † * Anglesea Building Room A2.13 Anglesea Road Portsmouth PO1 3DJ	Tel. +44 (0) 23 9284 2049 Contact: Mr I. de Oliveira Junior isocrates.deoliveirajunior@port.ac.uk
† Approved school for Category 1 certification *Courses in English available		

Table 5.2 – ESA-approved skills certification schools for electronic assembly techniques

6. Approval of Certification Centres

6.1   Application for Approval

To apply for ESA-approval, a potential skills certification centre shall submit the following information to the ESA nominated Manager:

1. Supporting letter from an ESA delegate.
2. Geographical and language coverage of the applicant school.
3. An assessment of the potential market for the centre in terms of sustainability.
4. Business plan.
5. An assessment of whether the centre has access to the resources (human and physical) needed in order to meet the standards.
6. Documented procedures and instructions relating to the operation of the certification programme.
7. Supporting letter from an electronic manufacturer from the proposed geographical and / or language coverage.
8. Report detailing the experience in electronic assembly and training.

An assessment of the information provided is undertaken by ESA in order to approve a new centre.

6.2   Review and Monitoring

6.2.1   Periodic Review

The audit of the skills certification centres shall be conducted in compliance with the audit form (see Annex 1).

Both ESA-approved certification centres and in-house training/certification operated by an ESA instructor shall be audited at least once every four years by ESA.

6.2.2   Complaints

Complaints may fall into the following categories:

1. A complaint by a trainee about a skills certification centre. This should be sent to ESA and the centre.
2. A failure traced to unsatisfactory work by a certified operator or inspector. It is the responsibility of the employer and/or ESA, based on objective evidence related to mandatory inspection points (MIPs) and non-conformance reports (NCRs) to raise a complaint.

In both cases the ESA-nominated manager investigates the complaint and reports back to the skills certification centre and the complainant regarding the action to be taken to resolve the issue.

6.3   ESA Approval, Change and Withdrawal of Approval Status

6.3.1   ESA Approval

Based on a review of the centre's documentation and an ESA audit, approval is granted if the skills certification centre has passed and there are no major actions outstanding.

Approval is awarded in the form of a letter signed by the ESA, giving

1. Details of the skills certification school, e.g. name of the centre and abbreviated address.
2. A list of courses

6.3.2   Extension

A skills certification centre applies to extend its certification portfolio (scope) by submitting details of a new course to the ESA for assessment.

6.3.3   Reduction

The approval scope can be reduced either by the skills certification centre (notification to ESA in writing), or as a result of complaints and audits.

The scope can be reduced if:
1. The capability of a skills certification centre has been reduced in terms of personnel or facilities.
2. Corrective actions with respect to a particular accreditation have not been satisfactorily implemented.

6.3.4   Withdrawal

Approval can be withdrawn either by application from the certification centre in writing, or as a result of complaints and audits:
1. The skills certification centre loses its staff or closes.
2. Assigned major corrective actions with respect to the provision of the certification service have not been cleared as agreed with the ESA.
3. The certification centre representatives do not attend the annual skills certification schools meeting (see also 8).

7. Annual Skills Certification Centre Meeting

A meeting of all ESA-approved skills certification centres is organised by ESA every year. The meeting shall be attended by the certification centre manager and by all Category 1 instructors from each school.

Additional meetings aimed at maintaining currency of certification are held whenever a major revision of any standard is introduced.

8. Maintenance of Records by ESA

8.1   Assessment Records

ESA generates and maintains a file for each skills certification centre comprising the two most recent audit reports and associated corrective action clearance records.

8.2   Certified Personnel List

Each skills certification centre generates and maintains a list of certified operators, inspectors and instructors (see 5.5).

8.3   Certified Instructors List

A list of Category 1 certified instructors is maintained by ESA.

ANNEX 1

CHECKLIST FOR THE ASSESSMENT, AUDIT AND MONITORING OF ESA-APPROVED
SKILLS CERTIFICATION (Electronic Assembly Techniques)

1) INTRODUCTION
    This document serves as a checklist for the assessment, audit and monitoring of
    ESA-approved skills certification centres and in-house training/certification schools
    (Electronic Assembly Techniques).
    Audits are undertaken at least once every four years.

    This audit has been organized in order to assess the suitability of the ESA skills certification
    centre or in-house training/certification school shown below. Records of evidence viewed
    shall be provided in the check list.

2) ADMINISTRATION
    ESA 'Assessor' for the Accreditation is:
    Certification Centre contact (present during assessment/audit):
    Name of Centre (School):
    Address of Centre:

    Contact details -   Telephone:
                             E-Mail:
    Date of Visit/Audit:

3) DESCRIPTION OF CENTRE
a) Managing Director of Centre:
    ESA-Centre Manager:

b) Centre is accredited for certification in accordance with the following Process
    Standards:
c) ESA-Approved Instructor(s) are employed by the Centre:
    Name of Cat 1 and associated certification status and school where they got there
    certification:
    Date of last recertification of the Cat 1:
    Was there any RFW issued for ESA skills certification school personnel?
d) Teaching infrastructure/classrooms are adequate:
    Light:
    Equipment:
    soldering,
    inspection:
    ESD control:
    ESD bench:
    ESD wrist:
    Use of gloves, finger cots:
    Cleanroom:

e) Facilities exist to cover the certification of each Process, these include:
    • the written methods (procedures),
    • suitable equipment,
    • well maintained tools,

- adequate stocks of materials and components and
- examples of acceptable/rejected workmanship described in the process standards:

f) Course Outlines exist describing: aims; experience and pre-requisites; duration
and syllabus:
(Note preferred individual course outlines are distributed by ESA as shown in Annexes 3 – 9
of this document)

g) ESA-approved examination suggestions are followed; for instance the question papers
and the certification school printed circuit board.
ECSS-Q-ST-70-26: X questions
ECSS-Q-ST-70-08 Cat 3: X questions
ECSS-Q-ST-70-38 cat 3: X questions
ECSS-Q-ST-70-08/38 cat 2: X questions
ECSS-Q-ST-70-30: X questions
ECSS-Q-ST-70-18: X questions

h) Course fees are established and appropriate:

4) RECORDS

a) School maintains records of personnel certification and performance for 4
years:
- Certificate in compliance with Annex 2
- The introduction letter will identify the following:
  - o that the certificate is the property of ESA skills certification centre
  - o that any interruption of more than 9 months invalidates the certificate
  - o In case of notified problems, the company shall inform ESA skills
    certification school
- ESA skills certification schools inform ESA in case complaints are made by their
  customer whatever is the nature of the complaint.

b) Details of the employer together with either the employer's address or the address of the
candidate.
c) The application form is kept with the applicant dossier.
d) A RFW is issued in case the application is not in compliant with the ESA STR-258.
e) Certification category attained.
f) Date of certification or re-certification.
g) Marked written test papers (examination) exist and are suitably stored
h) Trainee-assembled test specimens exist and are suitably stored.
i) Information regarding withdrawal of certified status (see also 7b).
(3 causes for suspension: -Visual Acuity requirements not met, -generic poor solder or
inspection quality (information from ESA, from the customer or third party), -abuse of
certification status (Cat 2 being not Cat 2))
j) A list of Certified Operators, Inspectors and Instructors exists.

5) CERTIFICATES

a) Certificates having ESA-agreed layouts and logos are issued to operators,
inspectors and instructors who have successfully completed the individual
courses.
b) Details of the courses (processes, standard identification) and validity dates
are stated on the certificate.
c) Authorisation signatures exist on the certificates.

6)   ADDITIONAL FACTS
a)   Courses are presented in which language(s)?
b)   Centre has adequately assessed the marketing of courses (related to
        sustainability of school)?
c)   A website or booklet summarising the ESA-approved course outlines exists:
        This should contain a description of what is meant by Certification to
        Categories 3, 2 and 1; any pre-requisites for the candidates; the course fees,
        addresses of local hotels or residences and details of the preferred means to
        reach the Centre (including a local map).
d)   Centre has the resources (human and physical) to meet the standards.
e)   The School Manager and Cat 1 have attended the Annual Skills certification School
        Meetings.
f)   A list of Certified Instructors (Category 1) is forwarded to the ESA nominated Manager.

7)   INVESTIGATION OF COMPLAINTS
a)   Have formal complaints been received?
b)   Where a trainee complains about a certification School: ESA nominated Manager will
        investigate and take any action and may withdraw School Certification.
c)   Did an employer inform the school about unsatisfactory work performed by a certified
        operator or inspector (e.g. related to space hardware failures, rejected workmanship at
        mandatory inspection points (MIPS) or non-conformance reports (NCRs)?
        ESA School Manager will take action and may withdraw operator or inspector certification.
d)   Was the feedback form from the students taken into account for improvement? To provide
        example(s).

8)   INSPECTION OF WORKMANSHIP OF THE TEST SPECIMENS
        Auditors will take a sample of stored specimens and inspect them.

9)   SUMMARY OF FINDINGS AND CORRECTIVE ACTIONS NECESSARY

10)   CONCLUSION TO THIS ASSESSMENT, AUDIT AND MONITORING
        EXERCISE
        Based on this Assessment Report, the ESA assessor recommends to the ESA nominated
        Manager:
                AWARDS ESA ACCREDITATION to the Skills certification School
                AWARDS AN EXTENSION to the scope of the certification provided by the School
                REDUCES OR WITHDRAWS the accreditation provided by ESA to the
                School:
                CONDITIONALY SUITABLE providing completion of actions.

11)   SIGNATURES
        Audit assessment carried out by: (ESA nominated Manager or assessor):

        In the presence of School Manager:

        Date:

ANNEX 2

EXAMPLE OF ESA CERTIFICATES
Please note that in-house re-certification certificates must not carry ESA logo.

ESA-Approved Skills
Training School
Logo

CERTIFICATE
this is to certify that

John Smith

is authorised to perform solder assembly operations in conformance with ECSS-Q-ST-70-08, ST-70-28, ST-70-38, RF cable assembly operations in conformance with ECSS-Q-T-70-18, crimping & wiring operations in conformance with ECSS-Q-ST-70-26 and wire-wrapping operations in conformance with ECSS-Q-ST-70-30

(Category 3)

Date of issue: *January 2020*   Date of expiry: *January 2022*

_____

Name
ESA-certified instructor or Training School Manager   Cert Ser No. 0000

ESA-Approved Skills
Training School
Logo

CERTIFICATE
this is to certify that

John Smith

is authorised to inspect solder assembly operations in conformance with ECSS-Q-ST-70-08, ST-70-28, ST-70-38, RF cable assembly operations in conformance with ECSS-Q-T-70-18, crimping & wiring operations in conformance with ECSS-Q-ST-70-26 and wire-wrapping operations in conformance with ECSS-Q-ST-70-30

(Category 2)

Date of issue: *January 2020*   Date of expiry: *January 2022*

_____

Name
ESA-certified instructor or Training School Manager   Cert Ser No. 0000

ESA-Approved Skills
Training School
Logo

esa
European Space Agency

CERTIFICATE
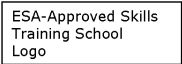### this is to certify that

John Smith

*is authorised to instruct, inspect and perform, according to ESA-STR-258, solder
assembly operations in conformance with ECSS-Q-ST-70-08, ST-70-28, ST-70-38,
RF cable assembly operations in conformance with ECSS-Q-T-70-18, crimping &
wiring operations in conformance with ECSS-Q-ST-70-26 and wire-wrapping
operations in conformance with ECSS-Q-ST-70-30*

(Categories 1, 2 & 3)

Date of issue: *January 2020*   Date of expiry: *January 2022*

_____   _____

Name
ESA-certified instructor or Training School Manager   ESA Manager

Cert Ser No. 0000

ANNEX 3

ESA Course Outline: Hand Soldering Operator
ECSS Standard ECSS-Q-ST-70-08

This ESA-approved course provides basic information on the use of materials in the space environment and develops the practical skills and theoretical knowledge necessary to fulfil the task of ESA Soldering Operator. These requirements are designed to ensure process consistency and acceptable workmanship standards resulting in the production of high-reliability hand-soldered connections.

ECSS-Q-70-08 "Manual Soldering of High Reliability Electrical Connections" forms the basis for this course.
This course is intended for Production Operators. The course provides practical hands-on experience. All necessary tools and equipment are supplied, although delegates are welcome to bring their own hand tools if desired.

1. **COURSE AIMS**
   - To review and understand the requirements of ECSS-Q-ST-70-08
   - To identify the factors which influence the quality, reliability and performance of a solder joint
   - To develop correct hand-assembly methods and reliably produce joints to the standards demanded by ECSS-Q-ST-70-08
   - To develop ability to examine and analyse faults associated with solder joints in accordance with ECSS-Q-ST-70-08

2. **EXPERIENCE AND PRE-REQUISITES**
   - minimum 2 years with electronic components and assembly processes
   - fully trained and qualified by the employer in the processes covered by the standard
   - a positive attitude to high quality workmanship
   - an application form must be submitted, countersigned by the employer and approved by the ESA Centre before booking would be accepted.
   - a conforming visual acuity certificate held by the employer and certified by countersignature on the course application form.

3. **COURSE CONTENT**

   - Introductions & orientation, including safety, facilities, routines and break times
   - Course introduction: what we will be studying, how, why and when
   - Review of specification framework: relevant ECSS standards; release status and how to access them
   - **ECSS-Q-70-08 Study:**
     - Scope, Terms & Definitions, Principles & Prerequisites
     - Preparatory conditions, Materials selection
     - Preparation for soldering
       - Practical exercise: demonstrate the use of cutters, strippers, anti-wicking tools and solder pot for the preparation of lengths of wires; the class can then prepare their own wires for subsequent terminal soldering exercises.
     - Mounting of components
       - Practical exercise
     - Attachment of conductors to terminals, solder cups and cables

- Practical exercise: demonstrate the soldering of previously prepared wires to terminals; silver-plated terminals to be pretinned, with excess solder being wicked off before wire attachment; the class can then commence terminal soldering exercises: side route turret, side route bifurcated, pierced, hook and solder cup. Demonstrate the soldering of a 'shield splice' to a cable shield; the class can then repeat the exercise.
  - o Soldering to terminals and PCBs
    - Practical exercise
  - o Cleaning of PCB assemblies
  - o Final Inspection
  - o Verification
  - o Quality Assurance
  - o Typical satisfactory and unsatisfactory solder connections

4. EXAMINATION

- **Practical test (Assembly onto ESA-approved certification PCB):**
  A selection of different types of components covered by the standard shall be fitted without rework, typically:
  - 3 large axial-leaded components
  - 3 small axial-leaded components (glass bodied) using various stress-relief forms and spacing
  - 3 radial-leaded components (horizontal and vertical mounting)
  - 3 metal-can (eg TO92) components using appropriate lead forms
  - 2 DIL components, one mounted on a high-heat-capacity site
  - Solder terminal to board using Sn96 solder, then solder wire(s) to it using Sn63 solder and necessary heat sinking to avoid remelt of the Sn96
  - Solder wire tails from above terminal, into plated through holes
  - Solder shield splice assembly to surface pads and PTH on PCB.
  - 2 connectors one being a Sub-D connector and one wired connector
  - Clean the board and complete own-board Inspection
  - Review own-board inspection with Instructor
- Corrective instruction will be given as required.
  - Undertake one rework maximum.

  All students are required to achieve successfully a minimum of 80% of the assembly after a maximum of 1 rework per package. Additional rework shall be requested to have a 100% successful assembly.

- **Multiple-choice operator theory test:** All students are required to achieve a minimum of 80% of 50 questions.

5. CERTIFICATE
On successful completion of the certification the candidates will be awarded Cat 3 certificate for the respective ECSS standard

The authorisation is valid for two years.

6. DURATION
4½ to 5 days

7. RECERTIFICATION
To renew certification for a further two years, attendance at a two-day recertification course is required.

ANNEX 4

ESA Course Outline: Hand Soldering Inspector
ECSS Standards ECSS-Q-ST-70-08, ECSS-Q-ST-70-38

This ESA-approved course develops an understanding of, and an ability to interpret, specifications covering high-reliability and high-quality electronic assemblies, and ensures that sufficient knowledge is gained to make confident decisions within the parameters of the specifications with an understanding of the use of materials in the space environment.

These requirements are designed to ensure process consistency and acceptable workmanship standards resulting in the production of high-reliability hand-soldered connections. ECSS-Q-ST-70-08 "Manual Soldering of High Reliability Electrical Connections" and ECSS-Q-ST-70-38 "High-reliability soldering for surface-mount and mixed technology" form the basis for this course.

This course is intended for Production Inspectors, and for Operators wishing to extend their certification to Inspection. Engineers and Technicians from Quality Assurance, Design and Manufacturing can also benefit from the course.
The course provides practical hands-on experience. All necessary tools and equipment are supplied, although delegates may bring their own hand tools if desired.

1. COURSE AIMS
- To review and understand the requirements of ECSS-Q-ST-70-08
- To review and understand the requirements of ECSS-Q-ST-70-38
- To identify the factors which influence the quality, reliability and performance of a solder joint
- To make a range of solder joints and understand hand-assembly methods necessary to produce reliable assemblies in accordance with ECSS-Q-ST-70-08 and ECSS-Q-ST-70-38
- To develop ability to examine and analyse faults associated with solder joints in accordance with ECSS-Q-ST-70-08 and ECSS-Q-ST-70-38
- To be able to inspect and evaluate electronic assemblies according to ECSS-Q-ST-70-08 and ECSS-Q-ST-70-38

2. EXPERIENCE AND PRE-REQUISITES
- familiarity with electronic components and assembly processes
- good practical and observational skills
- a positive attitude to high quality workmanship
- 2 years of inspection experience (full course), or 2 years of Operator certification (upgrade course).
- an application form must be submitted, countersigned by the employer and approved by the ESA Centre before booking would be accepted.
- a conforming visual acuity certificate held by the employer and certified by countersignature on the course application form.

3. COURSE CONTENT

- Introductions & orientation, including safety, facilities, routines and break times
- Course introduction: what we will be studying, how, why and when
- Review of specification framework: relevant ECSS standards; release status and how to access them

- **ECSS-Q-ST-70-08 Study:**
  - Scope, Terms & Definitions, Principles & Prerequisites
  - Preparatory conditions, Materials selection
  - Preparation for soldering
    - Practical exercise demonstrate the use of cutters, strippers, anti-wicking tools and solder pot for the preparation of lengths of wires; the class can then prepare their own wires for subsequent terminal soldering exercises.
  - Mounting of components
  - Attachment of conductors to terminals, solder cups and cables
    - Practical exercise: demonstrate the soldering of previously prepared wires to terminals; silver-plated terminals to be pretinned, with excess solder being wicked off before wire attachment; the class can then commence terminal soldering exercises: side route turret, side route bifurcated, pierced, hook and solder cup.
    - Practical exercise: demonstrate the soldering of a 'shield splice' to a cable shield; the class can then repeat the exercise.
  - Soldering to terminals and PCBs
  - Cleaning of PCB assemblies
  - Final Inspection
  - Verification
  - Quality Assurance
  - Typical satisfactory and unsatisfactory solder connections

- **ECSS-Q-ST-70-38 Study:**
  - Syringe, screen or stencil
  - Solder paste dispensing
  - IR profile check
  - Paste reflow characteristics
  - Pretinning
  - Component placement & reflow
  - Effects of varying belt speed and zone temperatures
  - Reflow soldering with hot air
  - Component designations
  - Selection of solder tips
  - Hand soldering leadless passive devices
  - Hand soldering leaded surface-mount devices
  - Complete hand-soldering exercises
  - View Inspection slides

4. EXAMINATION

- **(for Cat 2 only) Inspection of pre-assembled PCBs populated with components below**
- **(for Cat 3 upgrade to Cat 2 and 3) Practical exercises (Assembly onto ESA-approved certification PCB)**
  A selection of different types of components covered by the standard shall be fitted, typically:
    - 3 large axial-leaded components
    - 3 small axial-leaded components (glass bodied) using various stress-relief forms and spacing
    - 3 radial-leaded components (horizontal and vertical mounting)
    - 3 metal-can (eg TO92) components using appropriate lead forms
    - 2 DIL components, one mounted on a high-heat-capacity site

- Solder terminal to board using Sn96 solder, then solder wire(s) to it using Sn63 solder and necessary heat sinking to avoid remelt of the Sn96
- Solder wire tails from above terminal, into plated through holes
- Solder shield splice assembly to surface pads and PTH on PCB.
- 2 connectors one being a Sub-D connector and one wired connector

Corrective instruction will be given as required.
- Undertake rework as required
- Clean the board and complete own-board Inspection
- Review own-board inspection with Instructor
- Complete sample-board Inspection
- Review sample-board inspection with Instructor

All students are required to achieve successfully a minimum of 80% of the assembly after a maximum of 1 rework per package except for inspector only candidates. Additional rework shall be requested to have a 100% successful assembly.

- Inspector-only candidates do not require reaching flight standard for their solder-assembly ability.
- All students are required to have identified a minimum of 100% of defect on the inspected boards.

- **Multiple-choice operator test:**
  o **ECSS-Q-ST-70-08:** All students are required to achieve a minimum of 80% of 25 questions.
  o **ECSS-Q-ST-70-38**: All students are required to achieve a minimum of 80% of 25 questions.

5. CERTIFICATE

In accordance with this document, an ESA approved category 2 Certificate will be awarded on successful completion of the course for Inspector-only and category 2 and 3 Certificate will be awarded on successful completion of the course for Operator-Inspector.

The authorisation is valid for two years.

5. DURATION

4½ to 5 days for the full course (Inspector-only) and 3 days for an upgrade course from Operator to Operator-Inspector . Upgrade courses should be taken at the time of re-certification of currently held certificates as an additional course.

6. RECERTIFICATION

To renew certification for a further two years, attendance at a two-day recertification course is required for Inspector-only and a three-day recertification course for Operator-Inspector.

ANNEX 5

ESA Course Outline: RF Cable Assembly Operator
ESA Course Outline: RF Cable Assembly Operator **ECSS Standard ECSS-Q-ST-70-18**

This ESA-approved course is designed to review the practical skills and theories associated with the solder assembly, formation and preconditioning of semi-rigid RF cables. The course is based on the Solder Assembly requirements of ECSS-Q-70-18, "The Preparation, Assembly and Mounting of RF Coaxial Cables".

This course is intended for Production Operators, Quality Assurance Engineers and Design and Manufacturing Engineers.
The course provides practical hands-on experience. All necessary tools and equipment are supplied, although delegates are welcome to bring their own hand tools if desired.

1. **COURSE AIMS**
   - To review and understand the requirements of ECSS-Q-ST-70-18.
   - To identify the factors which influence the quality, reliability and performance of the assembly and its solder joints.
   - To verify appropriate skills and correct hand assembly methods.
   - To be able to examine and analyse faults associated with the assembly.

2. **EXPERIENCE AND PRE-REQUISITES**
   - Non-holders of ECSS-Q-ST-70-08 Cat 3 take the 4 days course.
   - Holders ECSS-Q-ST-70-08 Cat 3 take the 3 days course.
   - Applicants must be fully trained and qualified by their employers before applying for the course.
   - an application form must be submitted, countersigned by the employer and approved by the ESA Centre before booking would be accepted.
   - a conforming visual acuity certificate held by the employer and certified by countersignature on the course application form.

3. **COURSE CONTENT**

   - Introductions & orientation, including safety, facilities, routines and break times
   - Course introduction: what we will be studying, how, why and when
   - Review of specification framework: relevant and ECSS specifications; release status and how to access them
   - For non-holders of ECSS-Q-ST-70-08 Cat 3 only: ECSS-Q-ST-70-08 - review entire specification
   - Presentation of ECSS-Q-70-18:

• Check tools & RF Toolkit	• Connector & dielectric trimming
• Cable forming	• Centre pin soldering
• Cable preconditioning	• Degolding connector body
• Dimensional checking	• Cable construction
• Degolding & pretinning	• Own-work Inspection
• Connector types	• Review own-work Inspection
• Soldering methods	• Section end product if appropriate

- Clean-up & Check Tools
- Certification

6. EXAMINATION

- **Practical test:** Build of an RF cable, inspect own work.

  All students are required to achieve successfully a minimum of 100% of the assembly before after 1 rework.

- **Multiple-choice operator theory test:** All students are required to achieve a minimum of 80% of 20 questions.

7. CERTIFICATE

In accordance with this document, an ESA approved, category 3 Certificate will be awarded on successful completion of the course. Candidates already holding a valid ECCS-Q-ST-70-08 category 2 Inspector's certificate will be eligible to receive a category 2 certificate for this subject.

The authorisation is valid for two years.

5. DURATION

3 days or 4 days (for non ECSS-Q-ST-70-08 certified personnel).

6. RECERTIFICATION

To renew certification for a further two years, attendance at a one-day recertification course is required.

ANNEX 6

ESA Course Outline: Surface Mount Assembly Operator
ECSS Standard ECSS-Q-ST-70-38

This ESA-approved course develops an understanding of the practical advantages to be gained in designing and building using surface mount technology. The course has a practical bias including hand soldering as well as the methods of applying solder paste and available reflow heat sources. The course follows the requirements of ECSS-Q-ST-70-38, "High-reliability soldering for surface-mount and mixed-technology ". This course provides practical hands-on experience. All necessary tools and equipment are supplied.

1. COURSE AIMS
- To review and understand the requirements of ECSS-Q-ST-70-38.
- To develop the skills required for successful placement and hand soldering of leaded and leadless surface-mount components
- To identify methods of applying solder paste and gain practical experience of metered dispensing
- To become familiar with a range of reflow heat sources and their effect on the solderability of surface mount devices
- To demonstrate the advantages of surface-mount assembly.

2. EXPERIENCE AND PRE-REQUISITES
- Intended for Production Operators.
- Prior to taking this course, applicants should hold ECSS-Q-ST-70-08 certificate.
- Holders ECSS-Q-ST-70-08 Cat 3 take the 4 days course.
- Applicants must be fully trained and qualified by their employers in all aspects of the standard before applying for the course.
- Non-holders of ECSS-Q-ST-70-08 Cat 3 take the 5 days course.
- An application form must be submitted, countersigned by the employer and approved by the ESA Centre before booking would be accepted.
- A conforming visual acuity certificate held by the employer and certified by countersignature on the course application form.

3. COURSE CONTENT
- Introductions & orientation, including safety, facilities, routines and break times
- Course introduction: what we will be studying, how, why and when
- Review of specification framework: relevant ECSS specifications; release status and how to access them
- For non-holders of ECSS-Q-ST-70-08 Cat 3 only: ECSS-Q-70-08 - review entire specification
- Presentation of ECSS-Q-70-38;
- Syringe, screen or stencil?
- Solder paste dispensing
- IR profile check
- Paste reflow characteristics
- Pretinning
- Component placement & reflow
- Effects of varying belt speed and zone temperatures
- Reflow soldering with hot air
- Component designations
- Selection of Metcal, Pace & Weller tips
- Hand soldering leadless passive devices

- Hand soldering leaded surface-mount devices
- Complete hand-soldering exercises
- View Inspection slides
- Own-board Inspection

- Complete own-board Inspection
- Review own-board inspection with Instructor
- Undertake rework as required
- Clean-up & Check Tools

4. EXAMINATION

- **Practical test (Assembly onto ESA-approved certification PCB)**
  A selection of different types of components covered by the standard shall be fitted, typically:
  - 6 Chip Capacitors (sizes 0805 and/or 1206 and/or 1210 and/or 1812 and/or 2220);
  - 4 Chip resistors (sizes 2522 and/or 2010 and/or 1206);
  - 4 Chip resistors (sizes 0805 and/or 0603 and/or 0402);
  - 2 Tantalum capacitors;
  - 2 Cylindrical components;
  - 1 Flat Pack;
  - 1 LCC2 or LCC3 or LCC6
  - 1 LCC16 or LCC20 or LCC24
  - 1 QFP208 (pitch 0,5 mm)
  - 1 JLCC
  - 1 SMD 05

  Corrective instruction will be given as required.
  - Clean the board and complete own-board Inspection
  - Review own-board inspection with Instructor
  - Undertake maximum one rework when required

  All students are required to achieve successfully a minimum of 80% of the assembly after a maximum of 1 rework per package. Additional rework shall be requested to have a 100% successful assembly.

- **Multiple-choice operator theory test:** All students are required to achieve a minimum of 80% of 25 questions.

5. CERTIFICATE

In accordance with this document, an ESA approved, category 3 Certificate will be awarded on successful completion of the course. Non-holders on ECSS-Q-ST-70-08 can only receive a ECSS-Q-ST-70-38 certificate.

The authorisation is valid for two years.

6. DURATION

4 days or 5 days (for non ECSS-Q-ST-70-08 certified personnel).

7. RECERTIFICATION

To renew certification for a further two years, attendance at a 2-day recertification course is required.

ANNEX 7

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ESA Course Outline: Crimping Operator/Inspector
ECSS Standard: ECSS-Q-ST-70-26

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This ESA-approved course provides basic information on the use of materials in the space environment and is designed to review the practical skills and theories associated with the Crimping Processes. The course is based on ECSS standards ECSS-Q-ST-70-26 "The Crimping of High-Reliability Electrical Connections".

This course is intended for Production Operators. Engineers from Quality Assurance, Design and Manufacturing also benefit from the course. The course provides practical hands-on experience. All necessary tools and equipment are supplied, although delegates are welcome to bring their own hand tools if they wish.

1. **COURSE AIMS**
    - To review and understand the requirements of the ECSS-Q-ST-70-26.
    - To identify the factors which influence the quality, reliability and performance of Crimped connections.
    - To develop correct assembly and testing methods.
    - To confirm ability to identify and analyse faults associated with these termination methods.

2. **EXPERIENCE AND PRE-REQUISITES**
    - Minimum 1 year with electronic crimping and assembly processes
    - Applicants must be fully trained and qualified by their employer in all aspects of the standard before applying for the course.
    - A positive attitude to high quality workmanship
    - an application form must be submitted, countersigned by the employer and approved by the ESA Centre before booking would be accepted.
    - a conforming visual acuity certificate held by the employer and certified by countersignature on the course application form.

3. **COURSE CONTENT**
    - Introductions & orientation, including safety, facilities, routines and break times
    - Course introduction: what we will be studying, how, why and when
    - Review of specification framework: relevant ECSS standards; release status and how to access them
    - Theory of solderless connection methods
    - Knowledge of critical parameters affecting quality and function of connections
    - Presentation of ECSS-Q-ST-70-26:
    - Tools & gauges
    - Crimp formats
    - Wire and terminal selection and preparation
    - Tensile testing sample connections
    - Dispersive crimping
    - Use of spreadsheet; variance and process capability
    - Analysis of results
    - Compactive crimping
    - Analysis of results
    - Own-work Inspection
    - Clean-up & Check Tools
    - Certification

8. EXAMINATION

- **Practical test**: Samples are generated, tensile tested and results are recorded and analysed. All students are required to achieve successfully a minimum of 100% of the assembly.

- **Multiple-choice operator theory test:** All students are required to achieve a minimum of 80% of 25 questions.

9. CERTIFICATE

In accordance with this document, an ESA approved, category 2 and 3 Certificate will be awarded on successful completion of the course.

The authorisation is valid for two years.

5. DURATION
2 days

6. RECERTIFICATION
To renew certification for a further two years, attendance at a 1-day recertification course is required.

ANNEX 8

ESA Course Outline: Wire-Wrapping Operator/Inspector
ESA Course Outline: Wire-Wrapping Operator/Inspector **ECSS standard: ECSS-Q-ST-70-30**

This ESA-approved course provides basic information on the use of materials in the space environment and is designed to review the practical skills and theories associated with the Wire Wrapping Processes. The course follows the requirement of the ECSS-Q-ST-70-30 "The Wire Wrapping of High-Reliability Electrical Connections".

This course is intended for Production Operators. The course provides practical hands-on experience. All necessary tools and equipment are supplied, although delegates are welcome to bring their own hand tools if they wish.

1. **COURSE AIMS**
   - To review and understand the requirements of ECSS standard.
   - To identify the factors which influence the quality, reliability and performance of Wire Wrapped connections.
   - To develop correct assembly and testing methods.
   - To develop ability to identify and analyse faults associated with these termination methods.

2. **EXPERIENCE AND PRE-REQUISITES**
   - Minimum 1 year electronic wiring and assembly processes
   - Applicants must be fully trained and qualification by their employer in all aspects of the standard before applying for the course
   - a positive attitude to high quality workmanship
   - an application form must be submitted, countersigned by the employer and approved by the ESA School before booking would be accepted.
   - a conforming visual acuity certificate held by the employer and certified by countersignature on the course application form.

3. **COURSE CONTENT**
   - Introductions & orientation, including safety, facilities, routines and break times
   - Course introduction: what we will be studying, how, why and when
   - Review of specification framework: relevant ECSS standard; release status and how to access them
   - Theory of solderless connection methods
   - Knowledge of critical parameters affecting quality and function of connections
   - Wire-Wrap Tools
   - Wire-wrap posts and wire selection
   - Wire Wrapping
   - Logging and analysis of results
   - Own-work Inspection
   - Clean-up & Check Tools
   - Certification

   1. **EXAMINATION**

- **Practical test:** Samples are generated and inspected.
  All students are required to achieve successfully a minimum of 100% of the assembly.

- **Multiple-choice operator theory test:** All students are required to achieve a minimum of 80% of 25 questions.

2. CERTIFICATE

In accordance with this document, an ESA approved, category 3 Certificate will be awarded on successful completion of the course.

The authorisation is valid for two years.

5. DURATION
1 day.

6. RECERTIFICATION
To renew certification for a further two years, attendance at a 1-day recertification course is required.

ANNEX 9

ESA Course Outline: Instructor
CATEGORY 1

This ESA-approved course verify the practical skills and theoretical knowledge necessary to fulfil the task of ESA Category 1 Instructor.

1. COURSE AIMS
- To review and understand the content of ESA STR-258
- To build on existing knowledge of those specifications that the delegate will be required to instruct. These will be taken from the following: ECSS-Q-ST-70-08, 70-18, 70-26, 70-28, 70-30, 70-38
- To develop instructional and demonstration skills
- To enable the delegate to manage a certification course, its documentation and the archiving of records and certificates.

2. EXPERIENCE AND PRE-REQUISITES
- an ability to instruct, demonstrate and present with at least two years of experience as an in-house trainer, this must be recorded by ESA
- possession of a Category 2 and Category 3 certificates (each of which shall have been issued within the last 4 years) and the last one issued by an ESA-approved skills certification centre
- an application form must be submitted, countersigned by the employer and approved by the ESA-approved Centre before a booking would be accepted.
- a conforming visual acuity certificate held by the employer and certified by countersignature on the course application form.

3. COURSE CONTENT
Week 1
- Introduction and selection of Demonstration and Mini Lecture subjects
- Presentation of ECSS-Q-ST-70-08; multiple-choice operator test
- Presentation of ECSS-Q-ST-10-09; multiple-choice inspector test
- Presentation of ECSS-Q-ST-70-38; multiple-choice test*
- Presentation of ECSS-Q-ST-70-28; multiple-choice test*
- Presentation of ECSS-Q-ST-70-18; multiple-choice test*
- Presentation of ECSS-Q-ST-70-26; multiple-choice test*
- Presentation of ECSS-Q-ST-70-30; multiple-choice test*

* according to those subjects that the participant will be required to instruct.

Week 2
- Review of ESA STR-258; multiple-choice test
- Practical assembly exercises as required by each relevant standard (see individual course descriptions)
- Prepare and deliver practical demonstrations for each subject/standard aimed to be certified in
- Prepare mini lectures for any revisions to relevant standards

4. CERTIFICATE
In accordance with this document, an ESA Certificate authorising the holder to instruct and examine in selected subjects, will be prepared, on successful completion of the course. This certificate will

be submitted to the ESA nominated manager for validation. After validation, the certificate will be sent to the participant.

The authorisation is valid for two years.

Additional subjects can be added after Category 1 certification, at the time of the re-certification.

5. DURATION
10 days

6. RECERTIFICATION
To renew certification for a further two years, attendance at a recertification course is required. This course should be between five and nine days, depending on the number of the subjects re-certifying in.

Instructors who continued to actively practice Inspection and Operator skills and processes in the period since last recertification will maintain their certification in categories 1, 2 and 3.

Instructors who did not continue to actively practice their Inspection or Operator skills will have the new certificates amended to show Category 1 and 2 or Category 1 and 3, respectively.

Instructors who did not actively practice their Inspection and Operator skills will have the new certificates issued as Category 1 only.

ANNEX 10

Request for a waiver template:

ESA-Approved Skills Certification Centre Name / Logo	REQUEST for WAIVER	RFW Nr.: YYYY-SerialNo Date: Issue:	Page 1 of 1	
	PROGRAMME: **ESA Skills Certification**		Recurring Yes ☐ No ☐	
TITLE:		COURSE SUBJECT:	ECSS:	
SPECIFICATION AFFECTED: ESA-STR-258				
SECTION:				
DESCRIPTION OF WAIVER:				
NEED FOR AND JUSTIFICATION OF WAIVER: *To be filled by Applicant Company*				
ESA Centre Position: *To be filled by ESA Centre Manager or Instructor on receipt of the form from the Company.*				
Participant Employer's Position: *To be filled by Applicant Company*				
ESA Centre SIGNATURES				
Centre Manager Date:		Centre Instructor Date:		
ESA-ESTEC SIGNATURES				
Approved Disapproved		Name:	Date:	

ANNEX 11

ESA Course Application Forms:

ESA Course Application Form – Operator & Inspector

The purpose of this form is to assess a candidate's suitability prior to completion of a Booking Form.

Name _____   **Position** _____

Department _____   **Company** _____

Address _____   **Telephone** _____

_____   **Email** _____

ESA Course applied for			
Please enter "C" for certification or "R" for re-certification, as required	Operator Cat 3	Inspector Cat 2	For any re-certifications: ESA School in which the first certificate was awarded and the year
ECSS-Q-ST-70-08			
ECSS-Q-ST-70-38			
ECSS-Q-ST-70-18			
ECSS-Q-ST-70-28			
ECSS-Q-ST-70-26			
ECSS-Q-ST-70-30			

If you are only Re-certifying in the subjects already held, please skip the next step.

If applying for any first time Certification, please enter details of your experience as an Operator or an Inspector. *Certification courses require a minimum of 2 years of relevant experience. Experience only counts if your role requires daily involvement with the respective activities.* Please enter the number of years of experience in the corresponding box(es) below.

Experience	Operator	Inspector
THT Solder assembly		
SMT Solder assembly		
RF Cables		
Crimping		
Wiring		

It is the responsibility of the employer to train and qualify their personnel prior to proposing their application for an ESA certification. Acceptance on, and attendance of, an ESA approved course does not guarantee that the participant will be ESA certified by the end of the course. ESA certification is granted on exceeding the minimum workmanship standards and minimum pass criteria for the theoretical examination for each subject and category applied for. The employer is responsible for and shall hold a valid Visual Acuity record for the applicant.

Signatures: _____ **(Applicant)** _____ **(Applicant's Manager)**

Date: _____ _____ **(Manager's printed name)**

ESA Course Application Form   Please email the completed and signed form to: <email address>

ESA Course Application Form – Instructor – STR-258

The purpose of this form is to assess a candidate's suitability prior to completion of a Booking Form.

First time applications require ESA approval.

Name _____ **Position** _____

Department _____ **Company** _____

Address _____ **Telephone** _____

_____ **Email** _____

If you are only recertifying in the subjects already held, please complete the table below:

ESA Instructor Recertification Subjects applied for		ESA School in which the first Cat 1 certificate was awarded	Is the Instructor still active as an Inspector and/or Operator? [No, I, O, I&O]
Please enter "R" for re-certification, as required	Instructor Cat 1		
ECSS-Q-ST-70-08			
ECSS-Q-ST-70-38			
ECSS-Q-ST-70-18			
ECSS-Q-ST-70-28			
ECSS-Q-ST-70-26			
ECSS-Q-ST-70-30			

For first time Instructor Application, please complete the table below against relevant subjects:

ESA Instructor Certification Subjects applied for		ESA Operator history Category 3		ESA School where you gained your first certificate	ESA Inspector history Category 2		ESA School where you gained your first certificate
Please enter "C" for certification, as required	Instructor Cat 1	Year of first certifi-cation	(Two) Most recent (re)-certification Year(s)		Year of first certifi-cation	(Two) Most recent (re)-certification Year(s)	
ECSS-Q-ST-70-08							
ECSS-Q-ST-70-38							
ECSS-Q-ST-70-18							
ECSS-Q-ST-70-28							
ECSS-Q-ST-70-26							
ECSS-Q-ST-70-30							

If you are applying for a Category 1 course in an ESA School where you did not gain your first Cat.3/Cat.2 certificates, please provide evidence of your first certifications in both categories in an attachment.

First time certification for Category 1 requires that applicants have at least two years of experience as an internal trainer and that they are recorded as such by ESA. Acceptance on, and attendance of, an ESA approved course does not guarantee that the participant will be ESA certified by the end of the course. ESA certification is granted on exceeding the minimum workmanship standards and minimum pass criteria for the theoretical examination for each subject and category applied for. The employer is responsible for and shall hold a valid Visual Acuity record for the applicant.

Signatures: _____ **(Applicant)** _____ **(Applicant's Manager)**

Date: _____ _____ **(Manager's printed name)**