

GENERAL TOOLING
DOCUMENT

NEW February 1, 2006

REVISION SUMMARY

<u>Rev Level</u>	<u>Effectivity Date</u>	<u>Description</u>
N/C	10/29/10	Reformatted and Deleted B1.7 Obsolete References
1	05/3/11	Revise Titles, changed Supplier Tooling Document to General Tooling Document
2	07/18/17	Revised "Cessna" to TAI references

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GENERAL TOOLING DOCUMENT

SECTION A

GENERAL REQUIREMENTS

A-1. Applicability

The supplier is responsible for complying with the applicable provisions contained herein. This requirement is established by virtue of the General Tooling Document being called out in the CSF2000 Terms and Conditions.

A-1.1 In the event document interpretation or clarification is needed, TAI Supply Chain will contact the appropriate Tooling representative at TAI.

A-2. Title of Tooling

A-2.1 Title of ownership of all tools procured under the provisions of this Document shall rest with TAI.

A-3. Reimbursable Tooling Costs

A-3.1 The supplier will confine his bids and invoices for tools to the categories described in Section C, Paragraph 6.9.

A-4. Non-Reimbursable Tooling Costs

A-4.1 The supplier is obligated to keep the tools in good condition and repair the tools up to the defined life of the tool.

A-5. Storage and Maintenance of Tools

A-5.1 The supplier is responsible for care, maintenance and use of tooling in accordance with sound industrial practices and the terms of the PO while in their possession. Maintenance includes preventive maintenance, taking precautions to prevent deterioration, corrosion, proper storage, keeping maintenance records, correction for wear and damage to ensure that the tooling will produce acceptable parts for the expected rate and life as described by this document. Normal maintenance (repair/rework) should not change the fit, form, or function of the tool.

A-6. Damage, Loss, or Misuse of Tools

A-6.1 The supplier shall inspect all incoming tools upon receipt. Any damage, non-

conformities, or loss must be reported immediately to the TAI Buyer. The supplier shall be responsible for cost of repair or replacement of TAI-controlled tools which are damaged, lost, or misused while in supplier's possession. All lost, damaged, or destroyed tools must be reported immediately to the Buyer.

- A-6.2 TAI tools should be stored in some type of a building out of the elements. Fiberglass and graphite tools should be stored in areas away from extreme heat and/or cold conditions. All tools are to be wiped down after use and be free of contaminants before being stored. All large steel tools, STFB's, form dies, and other tools of this nature must have all forming surfaces covered with a heavy oil so as to prevent rust and corrosion.

A-7. Documentation Requirements

- A-7.1 TAI requires tool design or other documentation of specific tools manufactured for TAI by suppliers. This is defined in Section D. This documentation must be submitted with the certified tool list.

A-8. Tool Status Reports

- A-8.1 During the design and construction phase of the tooling subcontract, the supplier shall provide TAI with semi-monthly reports when required by TAI, describing progress and tool completions for the tool manufacturing period.

A-9. Inventory Requirements

- A-9.1 The supplier shall perform physical inventories of tools in the supplier's possession. All tools shall be inventoried yearly and at contract closing. The interval and timing of these inventories shall be coordinated with TAI Supply Chain and the Tool Control department. Tools should be checked to verify condition and that the correct TAI tool number, tool code, and ownership are clearly stamped on tools prior to results being submitted to TAI.

TAI reserves the right to conduct audits of inventory results and compliance with the General Tooling Document.

These activities are considered good business practices and, as such, are expected to be complied with by the supplier and not constitute additional cost billing.

A-10. Tool Control Records Must Contain at a Minimum:

1. Nomenclature/description of tool
2. TAI Tool Number
3. TAI Tool Code
4. Tool Ownership
5. Reference TAI Part Number
6. TAI PO number for which the tool was originally acquired or fabricated
7. Storage method & location
8. Dollar value of tool
9. Schedule for tool inspection and maintenance, and

10. Maintenance records.
11. Tool Dimensions
12. Tool Weight

A-11. Electronic Data

The supplier shall ensure all electronic data furnished to TAI is to the latest revision.
The file name of the electronic tool should have the tool number and tool code included.

A-12. Costs

All costs indicated in the document are in U.S. Dollars.

A-13. Exclusive Use

Suppliers shall not use tooling acquired, fabricated for, or furnished by TAI for purposes other than requirements under a TAI PO.

SECTION B

PROCEDURAL REQUIREMENTS

B-1. Submittal of Quotations for Tooling

B-1.1 The suppliers will submit the quote for tools via the Supplier Tooling Quote system via supplier.Cessna.com. The quote will include the TAI tool code, cost, part numbers used on, life of tool, brief description of tool function, and type of material used for construction of tool. This quote should be representative of the best estimate of tool requirements and estimated individual tool costs. No tools shall be made by the supplier prior to the issue of a PO. TAI will review the quote for conformance of tool to part configuration requirements, reasonableness of cost, and ability of tool to be used in-house if necessary. In the case where an existing tool is available the supplier shall be required to explain why the existing tooling cannot be used. TAI approval is required to build a new tool. The total costs submitted on the quote shall become a “not-to-exceed” value for the tool family required to manufacture the part(s) covered by the quote.

Items such as x-ray, test bars or coupons, destructive testing, set-up charges, qualification tests, penetrant etch, heat treatment, furnace charge, layout/dimensional checks, and shipping are not to be included on tooling Outside Production Tooling Requirement’s (Tooling Quote), original or certified. Costs for such items are to be placed against parts production orders.

B-1.2 When requested by TAI to build tools, the supplier shall submit with the quote for production tools a schedule and a tooling plan.

B-1.3 If duplicate or rate tooling is required it must be submitted on a rate quote. This can be found by going to supplier.cessna.com and clicking on Supplier Tooling. Click on “R” next to the tool that applies and proceed with completing the form.

B-1.4 In order to replace a tool that has exceeded its life or has been damaged or lost, the quote must state that it is a replacement and define the TAI tool number it is replacing.

B-1.5 TAI’s Outside Production Planning Sheet (OPSS) is considered proprietary and should not be disclosed to third parties.

B-1.6 If the tool is manufactured by the supplier and then sent to another supplier or moved to a different location, the TAI Buyer needs to be notified whereupon the TAI Buyer will notify Tool Control.

B-1.7 Writing a Tooling Quote

1. Go to supplier.cessna.com and click on Supplier Tooling. This will take you to the Supplier Tooling Main Menu.
2. Initiate Tooling Quote:
 - a. Click on Submit a New Quote.
 - b. Complete all boxes on the form and select from the drop-down lists in each space where applicable.
 - c. Submit the quote via the “Submit” button at the bottom of the page.
3. View Existing/Old Tool Information
 - a. Click on “View The List of Previous Quotes” in the Supplier Tooling Main Menu
 - b. To adjust pricing on a quote that is still in review, click on the quote number. The quote appears and the price can be adjusted until the Manufacturing Engineer has “Accepted” the quote.
 - e. To replace old or worn out tooling or dispose of old tooling, disposition needs to be obtained from the buyer. (Ref. B.1.7.4 and B1.7.11).
4. Disposition Old/Obsolete Tooling
 - a. Once negotiations for disposition of tool between Buyer, PE, and Supplier are complete, submit request for disposition of tooling.
 - b. At the Supplier Tooling Main Menu, click on “Submit a New Quote”.
 - c. Complete all boxes on the form and select from the drop-down lists in each space.
 - d. Submit the quote via the “Submit” button at the bottom of the page.

B-1.8 The supplier shall submit a tooling quote within 30 days of notification as the supplier selected. The tooling quote cost cannot be exceeded unless a quote is updated prior to PE quote approval. The quote once received by TAI is good for a maximum of 30 working days.

B-1.9 Once the tooling quote with the not-to-exceed cost is approved by TAI, a PO will be issued to the supplier by a TAI Ariba Coordinator. Payment for tooling can be made only after pictures have been received and reviewed by TAI Tool Control and the tool(s) incorporated into the Tool Control database.

B-1.10 TAI retains the right to audit individual tool cost and/or any combination of tools. Cost records must be retrievable for individual tools. Individual cost elements such as tool make, tool design, and tool material will be evaluated during a Tool Cost Audit.

B-1.11 Old/Obsolete Tool Disposal/Disposition- Completion of the “Tool Quote” form is required. Once submitted the request will be evaluated by Tool Engineering. Cost for disposal by the supplier will be compared to return and subsequent disposal by TAI. The “Tool Quote” form will be returned to the supplier for action designated on the form. Method of return will be indicated on the form. If the disposition is for the supplier to destroy the tools, photographs of the destroyed tool are required by Tool Control prior to disposal. All communications must include the TAI Buyer.

B-2 Requirement Changes

- B-3.1 Engineering design changes initiated by TAI will be submitted to the supplier for incorporation of the change. As on the tooling quote the supplier will submit tool costs separate from part or assembly costs via supplier.cessna.com, Supplier Tooling, and enter detail on the Submit a New Tool Quote form for modification of existing tool. The pull-down boxes will indicate the tool in question is to be reworked based on an engineering change/revision.
- B-3.2 When tools become obsolete and are not required for production, the supplier should request disposition. An explanation of how to fill out the disposition can be found in B-1.11. TAI will be responsible for providing that authorization to the supplier. Ref. B-6.

B-3 Submitting Documentation

- B-4.1 Upon specific request from TAI during the production contract, the supplier shall furnish copies of operation sheets and/or reproducible copies of tool design drawings to the latest design change. This material shall be furnished promptly. TAI will pay reproduction and shipping costs if not covered by basic contract.
- B-4.2 Upon completion or termination of the contract, the supplier shall submit to TAI the data of each tool design drawing up to date to the latest authorized change, incorporating any additional changes made by the supplier.
- B-4.3 Upon completion or termination of the subcontract, the supplier, at no cost to TAI, shall also furnish one complete set of operation sequence sheets on each detail, subassembly and complete assembly, and code reference sheets to identify tools and machines on which they are used. These operation sheets must reflect the tools used in the manufacture of the part or assembly identified to the operation and the machine on which each was used. They shall be protected and boxed with related tools.

NOTE: MPA & MIM and any other similar tooling are excluded from the worksheet requirement if by providing such would be considered proprietary information.

B-4 Transfer of Tooling

- B-5.1 Upon notification by TAI, the supplier shall prepare for shipment and assist with transfer of the tooling to any point specified at any time during the contract.
- B-5.2 TAI may, on a temporary basis, recall tools from a supplier. In such cases, the supplier shall return the tools on the date specified, if possible. Please reference the TAI Buyer's name on the packing sheet.
- B-5.3 The supplier shall be responsible for the proper protective crating and preservation to prevent shipping damage for all tool shipments from the supplier's facility.
- B-5.4 Tool Shipments: Prior to shipment, the proper TAI tool number and part

number must be permanently applied to the tool in accordance with C-3, Tool Identification.

- B-5.5 Tools with open PO's, such as new tools, reworked tools, and modified tools must have an approved quote and be identified properly before being transferred to another source. If an acceptable first article inspection report has not been completed, contact TAI's Supply Chain for instruction to complete certification.
- B-5.6 A move will constitute any type of change in the address of a tool.

B-5 Disposition of Tools That are Surplus to Present or Forecasted Future Requirements

- B-6.1 When a supplier's requirements for tools cease to exist because the parts requirements cease, the supplier must submit a request for disposition of these tools. An explanation of how to fill out the disposition is found in B-1.11.
- B-6.2 TAI will notify the supplier of the disposition:
 1. Stage tools for review by customer, or
 2. Return to TAI, or
 3. Surplus tools scrapped at supplier.

Tools returned to TAI are to be processed as TAI property. The packing Sheet must cite the TAI Buyer's name. Tools can only be surplus at the Supplier if given notification by TAI after a Tool Disposition is turned in from the supplier.

B-6 Proceeds From Sale of Scrapped Tools

- B-7.1 TAI-Owned Tools- Proceeds will be made payable to TAI unless other written agreements have been made.

SECTION C

TOOLING REQUIREMENTS

C-1 Tool Design Requirements

- C-1.1 Where design is specified for a tool, the design must conform to good tool design practice and provide the capability to remake or reinspect the tool to determine if it is holding dimensions and that there are no missing parts. All critical tool design dimensions must reflect allowable tolerances. Tolerances are per engineering or +/- 1/3rd engineering allowed tolerance, or what is called out on the tool design. Electronic tools will be based on engineering geometry. Tooling holes (tools) shall not exceed +/- .005 inch from nominal drawing dimension.
- C-1.2 Supplier's tool designs shall be consistent with the type, function, and life of the Tools as defined in C-6.9.2.
- C-1.3 The supplier is responsible to meet interchangeability requirements defined by OPSS or as shown on the engineering drawings.
- C-1.3.1 Master control tools must be designed and are required for Interchangeable three-dimensional and multiplane surfaces and related Attach patterns. (Not true if supplier has laser tracker type equipment)
- Also, TAI Tool Design must approve manufacturing tools and major assembly tools that control interchangeability with mating components made by TAI and major fixture designs, prior to manufacture. TAI will approve these designs for accuracy and tolerance at the points of interchangeability only. All other responsibility shall remain with the sub-contractor. Once approved, the designs cannot be changed at the points of interchangeability defined above unless re-approved by TAI.
- C-1.3.2 Designs for master control or other tools that control interchangeability between supplier-produced or supplier-purchased assemblies are wholly the responsibility of the supplier, unless specified by PO to be TAI's responsibility.
- C-1.3.3 Revisions to interchangeability requirements must be approved by TAI's Manufacturing Engineering and authorized by a POCR.
- C-1.4 Tool designs, photographs, and sketches will be identified with the tool number And tool code which they document.
- C-1.5 Tool design data for computer-generated tool surfaces will clearly specify any Shrinkage or other tooling factor that is included in the solids or surface model.
- C-1.6 Computer models that are developed or extended past the EOP (end of part) or EOL (end of lines) to facilitate tool or part fabrication will show these lines on a reference level of the software model.

C-2 Tool Photograph Requirements

- C-2.1 Two clear digital color photographs of each tool must be submitted unless the tool is a program/tape. (This excludes electronic tools such as NC tapes or electronic models)
- C-2.1.1 The photographs shall be of a professional quality. TAI recognizes That professional quality photography may vary; consequently, Professional quality refers to clarity, not photographer.
- C-2.1.2 One photo will clearly show the tool identified with the proper tool code, Part number, ownership, and tool number as prescribed in Section C-3. The other photo will show the tool form near a graduated scale in “inches” or “feet” showing the size of the tool.
- C-2.1.3 All photos shall be in color

NOTE: It is not the intent of TAI to use the photographs to obtain information of a proprietary nature from the suppliers. Consequently, for casting patterns, for example, the photos should not show gates or risers in place.

- C-2.1.4 The photographs shall be in JPEG or BMP format.
- C-2.2 Quotes that are for rework of tools valued in excess of \$1,500 shall have a photo showing the current condition of the tool requiring rework. TAI may request photos for rework under \$1,500 if deemed necessary.

C-3 Tool Identification

- C-3.1 The supplier will identify all tools manufactured for TAI. A metal Identification sent by TAI shall be permanently affixed to large assembly fixtures. The tag shall be permanently marked with the complete TAI tool number and tool code, applicable change identification, the name of the owner (i.e. TAI) and part number. Space for inspection stamps and dates must also be provided. If the fixture has removable locators, contour boards, etc., each item shall be identified with the basic tool number and detail number.
- C-3.1.1 When tool size or shape does not permit the ability to attach a tag, it is permissible to stamp tool information into tool in an area that will not affect part surface.
- C-3.2 TAI may under certain conditions spell out the full identification for each tool on the PO.
- C-3.3 An inspection acceptance stamp and date must be included on the tool.
- C-3.4 If size and utilization of a tool is such that a metal tag is not feasible, the same information may be affixed to the tool in a conspicuous place by electronic pencil, acid etch, steel stamp, or other permanent method.
- C-3.5 Tools, including pattern equipment, that have loose or detachable details must have the tool number on each piece along with consecutive numbers for the

loose pieces; i.e. 2 of 8, 3 of 8, etc.

- C-3.6 It is not acceptable for the supplier to make two tools on one base and identify as two separate tools. If a single tool produces more than one part number, all part numbers must be identified.
- C-3.7 New tools and any removable details weighing more than 30 pounds must be weighed and stamped with that weight. Characters of 3/8" height will be used for stamping the weight.
- C-3.7.1 The completed tool will be weighed and the weight stamped on the tool next to one of the lifting points and filled with red paint. If there are no specified lifting points, the weight will be stamped on the bottom of the tool tag and filled with red paint.
- Note: The 3/8" high characters on tools to be used in elevated temperatures (bond fixtures, etc.) will be filled with hi-temp red paint.
- C-3.7.2 The weight of details will be stamped on the detail or subassembly at one of the lifting points and filled with red paint. If there are no specified lifting points, the weight will be stamped near the detail or subassembly identification and filled with red paint.
- Note: On tools with details removable from other details, the weight identified must be the maximum possible weight lifted at that lift point (i.e., weigh the subassembly with all the details attached).
- The total weight will be stamped at a lifting point, a separately prepared aluminum tag, or at the tool tag if there are no lifting points specified.
- C-3.7.3 Composite Tooling – Tools made from composite materials will have the weight stamped on the inspection tag, if possible, and filled with red paint or a separate aluminum tag will be required.
- C-3.7.4 Removable details weighing over 30 pounds will have the weight stamped on an aluminum tag and attached to the detail with screws or a suitable bonding agent.
- C-3.7.5 Where the tool material is hardened and an aluminum tag is not practical, the weight may be "etched" in 3/8" high characters.
- C-3.7.6 Kirksite Dies – Kirksite dies will have the weight painted on each half of the die set near the tool identification. A minimum of 1" high characters will be used.
- C-3.7.7 Storage Boxes – Tools stored in boxes will have the weight of the tool plus the weight of the box stenciled on the box. A minimum of 1" high white characters will be used on the box in close proximity to the tool identification plaque.

C-4 Tool Inspection

- C-4.1 The supplier shall define, in appropriate form, a schedule for tool inspection and maintenance applicable to the tools involved. The supplier's inspection system shall contain controls which verify continued conformity of parts produced by the tool and which assure early detection and correction of unsatisfactory tool conditions. The tool inspection procedures used by the supplier shall be subject to performance review by TAI Quality representatives.
- C-4.2 All tooling located at the supplier's facility or at a supplier's facility specified by the supplier may be subject to inspection by TAI at any time during performance of the contract and/or upon termination of the contract. This may be a dimensional inspection and/or may be an inspection for accountability of all tools in the supplier's possession.
- C-4.3 All tools returned to TAI upon completion and/or termination of the contract will be inspected by TAI to determine the general condition. The disposition of all tools rejected by TAI shall be governed by the provision of TAI's PO and this General Tooling Document.

C-5 TAI-Furnished Tools

- C-5.1 TAI Normally furnishes master control tooling for the manufacture and control of production tools used for interchangeable hole patterns, contour, edge of part, hinge and latch points, etc. Other tools may be furnished by TAI such as engineering lines, design part tolerance (DPT), loft layouts, sample parts, check fixtures and tooling patterns if specified on the PO.
- C-5.2 Production tools furnished by TAI will be inspected prior to shipment to a supplier. Supplier's use of such tools is often on different equipment or by processes and methods different from TAI's. Therefore, suppliers shall run first part inspection for a tool check prior to production use. Adaptation charges for changes to TAI-furnished tooling for use on the supplier's equipment will be considered. Most method changes shall be at the supplier's expense. Major method changes must be negotiated at the time of contract.
- C-5.3 Where TAI-furnished tools are found to be in error at first use, TAI may authorize rework via a Modify/Rework quote. Periodic inspection and maintenance required to produce acceptable parts from tools shall be at the supplier's expense. Before tools become economically impractical to maintain, the supplier shall submit a quotation for the cost of replacement.
- C-5.4 Tools and gages loaned to the supplier by TAI shall be properly maintained and stored during the time they are in the supplier's possession. Damage or breakage beyond normal wear will require that the supplier make reimbursement to TAI for the replacement cost. Tools loaned for a specified period must be returned promptly on or before expiration of the period.

C-5.5 All shipments of tools received by the supplier shall be acknowledged by signing the packing sheet with the tools listed and returning a scanned/fax signed packing sheet to the Buyer.

C-6 Classifications and Definitions

C-6.1 TAI classifies the hardware required to make parts and assemblies into the following groups:

C-6.1.1 Equipment – Basic machines and installations classed as capital investments.

C-6.1.2 Equipment Accessories – Includes all attachments for any basic machines or installations, which are standard with the equipment, manufacturer, or any competitive manufacturer. (See following for examples)

- a. Boring bars- general purpose
- b. Chucks- grinding or lathe
- c. Collets- standard
- d. Dividing heads
- e. Mill vises
- f. Rotary tables
- g. Threading dies- die heads and die shocks
- h. Dresser attachments
- i. Hydro rubber retainers
- j. Stock feeders
- k. Chaser heads
- l. Turret attachments

C-6.1.3 Semi-Standard – Normally small and perishable tools, which have a limited general application and are unobtainable as standard catalogue items and special to TAI design requirements.

Examples: Round hole dies
Hole flanging dies
Bearing installation tools
Riveting sets

Depending upon circumstances, TAI may furnish designs and/or may sell the supplier an initial set.

C-6.1.4 Catalogue Standard – Normally small and perishable tools common to manufacturing operations that can be ordered from catalogues without special drawings.

Examples: Back spotfacers – standard
Band saws – stock and blades
Broaches – standard
Centers – standard and ball bearing types
Clamps – “C” clamps, body, and parallel
Counterbores – standard
Countersinks – standard
Diamonds – all
Drills – all-including checks, vises, sleeves, sockets, and extensions, and drill bushings used in casting

and forging qualification fixture (MQF).
Extractors – screw, tap, helicoil insert
Files – hand, machine, and band (all)
Grinding Wheels – all
Hobs – standard
Mill Cutters – all except cutters that have a contoured face or periphery. Corner radii not included.
Reamers – hand, machine, expansion, adjustable
Taps – all, up to and including 2” in NC, NF, NEF, and helicoil, also tap drivers and holders.
Threading dies – chaser
Tool Bits – single point (all)
Tool Holders – lathe (all)
Wire Brushes
Wrenches – standard

C-6.1.5 Temporary Tools

These are absolute minimum tools required to control quality on an initial or short run subcontract. Such tooling will cause considerable time for layout, setup, supervision and inspection, and tool costs are normally low when compared to the manufacturing cost of the parts. Parts produced from such tooling must, however, meet quality and interchangeability requirements defined on the TAI product drawing.

Cost of temporary tools, whether for a single parts order or as an interim Tooling method necessary to meet production schedule prior to availability of production tools, shall be priced as a separate line item on the PO And not amortized in the parts price.

C-6.1.6 Gages

TAI considers the following gages to be standard common methods Of measurement and not production tools:

- a. Caliper – spring and vernier
- b. Gages – vernier height, depth, protractor
- c. Gages – All male and female thread gages up to and including 2” for Standard threads described in USDC Screw Thread Standards or Federal Services H-28
- d. Gages – All plug gages up to and including 2”
- e. Gages – All dial bore indicators
- f. Gages – Telescoping gages
- g. Gages – Ball gages
- h. Gages – planer gages
- i. Levels – spirit, master, transit, and dumpy
- j. Micrometers – outside, inside, depth, and groove
- k. Parallels – box, bar, and magnetic
- l. Scales
- m. Sine plates and bars
- n. Squares – combination set and master

C-6.1.7 Permanent Production Tools

- a. These are tools designed and built to maintain a specified minimum production rate and life with minimum operator skill and maintenance, and within acceptable cost limitations. The tools must be such that they will maintain quality through a normal production run. These will include all jigs, dies, fixtures, molds, patterns, special taps, and special gages acquired or manufactured by the supplier for use in the performance of the subcontract with TAI, which are of such a specialized nature that without substitution, modification, or alteration their use is limited to the production of the articles covered by TAI PO's.
- b. TAI does not intend to own, pay for as tools, or take Possession of tooling not used on conventional equipment or by methods not generally accepted by industry.
- c. TAI will not pay for extrusion dies or forge dies as tools. These will be quoted separately from the forging or extrusion costs and will be treated by TAI as a nonrecurring charge. TAI will have exclusive use of these dies, which the supplier shall maintain at his cost.

C-6.1.8 Special Perishable Tools

- a. TAI will either furnish or pay for one initial "set" of such special perishable tools. These tools include special spline broaches, Fellows shaper cutters, special hobs, special Gleason generating cutters, modified or special milling cutters, etc. For quotation purposes, the supplier shall include Initial special perishable tools on the quote.
- b. A "set" is defined for this purpose as the minimum quantity of each tool necessary to sustain required production rates during the normal flow time for replacement. Replacement and maintenance of special perishable as well as other perishable tools shall be absorbed in supplier's overhead costs or amortized in the parts price. Since these tools are subject to wear, attrition through grinding and breakage, the supplier is responsible to procure and maintain a sufficient quantity for production requirements.
- c. The supplier shall be required to return one "set" of special perishable tools in usable condition at the end of the contract. These shall be of the same quantity and with the same TAI numbers as in the original set. Cutting edges must be protected by "Seal Peel" or equivalent.

C-6.2 Tool Codes and Definition

C-6.2.1 Tool Engineering Layouts

Tool Engineering Layouts are documents that qualify the technical Competency and critical coordination features of program tooling efforts.

Tool Engineering Layouts will be called out under the Miscellaneous Document Section and referenced in the instructions under Tooling

Quotes in the outside planning when applicable.

C-6.2.2 Current Tool Codes

The following list contains current tool codes for ordering new tools. It provides a brief definition of the tools and average tool life.

TOOL CODE	DEFINITION	Average Tool Life
ABF	<u>ASSEMBLY BOND FIXTURE</u> - A tool that is used to locate 2 or more parts to bond together per eng. Drawing and TAI Standard Material Practice 018 and 016.	<u>Metal</u> - life of program <u>Composite</u> - 350 cycles
ADJ	<u>ASSEMBLY DRILL JIG</u> - A jig used to hold two or more parts in the correct position with respect to one another for drilling operations. Usually of medium size, could be mounted on a stand or have a small framework sitting on floor.	Life of program
ADT	<u>APPLY DRILL TEMPLATE</u> - Used to locate from predrilled tooling holes or the edges of a part or nested contour to drill holes in an assembly or detail. Usually the holes to be drilled are located in such a place that drilling from drill bars attached to the jigs would not be feasible. Provision for the installation of optional equipment is often provided by ADT's. ADT's usually are used to drill details only.	Life of program
AJ	<u>ASSEMBLY JIG</u> - A small to medium bench-top jig used to assemble two or more parts in correct location together for drilling.	Until destroyed
ASP	<u>ASSEMBLY SAMPLE PART</u> - A production part that is used for fit purposes that does not match engineering, but does fit assembly and is okayed by engineering and quality control.	Life of program
ATT	<u>APPLY TRIM TEMPLATE</u> - Used as a guide for trimming extruded shapes and formed parts whose blanks cannot be cut to exact size and shape before forming. This template may show excess material if required. In most cases this template is made to apply to the outside of a part rather than the inside and is made a snug fit on the part. The template is usually made from steel stock formed over the part in the press, or it may be made by cutting a part into sections and reassembling these sections to make them capable of being applied to the part.	Life of program
BB	<u>BUCKING BAR</u> - Used on assembly line to buck rivets	Life of program
BD	<u>BLANKING DIE</u> - A die that is used to produce flat patterns or blanks of predetermined size and outline from sheet metal by means of a power press for steel or aluminum. Parts up to .064 and larger or thick use PRP, except small parts that would not strip from PRD.	Life of program
BF	<u>BROACH FIXTURE</u> - A fixture that is fastened to the faceplate of a broaching machine to hold parts for broaching operations. Broaching is a process by which a bit like tool is used for enlarging or shaping a hole.	Life of program
BFD	<u>BLANKING & FORM DIE</u> - A blanking and forming die incorporates a forming operation with the blanking operation so that both operations may be performed progressively and a part turned out with each stroke of the press.	Life of program
BFT	<u>BRAKE FORM TEMPLATE</u> - A physical tool fabricated from electronic data and/or manufactured toolmakers dimensions. Ordered when forming materials on brake equipment and when worker needs to set up machine to proper dimensions.	Life of program
BHF	<u>BOND HOLDING FIXTURE</u> - A tool that is used to locate 2 or more parts to bond together per eng. Drawing and TAI Standard Material Practice 018 and 016.	Life of program
BJ	<u>BRAZE JIG</u> - A jig used to hold parts for arc or gas brazing so that warpage is minimized and tolerances are maintained.	Life of program
BM	<u>BLOW MOLD</u> - A tool that is used for forming plastics and/or polycarbonate materials	Life of program

<u>TOOL CODE</u>	<u>DEFINITION</u>	<u>Average Tool Life</u>
	into duct forms. The molds consist of matched die halves which are supported vertically in the machine designed for this specific manufacturing operation. The die halves open and close laterally. When open, two sheets of part material preheated to a pre-determined temperatures are inserted between the die halves. The halves are closed and air is forced between the heated material sections and the air pressure expands the material to the die configurations. Seams are melted together during this process. The machine then opens laterally and the part is air cooled and removed from the die. Raw material blanks are not to exceed 24" x 24" due to the size of the machine.	
BOF	<u>BORING FIXTURE</u> - A fixture that is fastened to the table or the carriage of a boring machine, either vertical or horizontal, and is used for internal machining operations.	Life of program
BPDF	<u>BLANK, PIERCE, AND FORM DIE</u> - A die that incorporates piercing, blanking, and forming operations so that all may be performed progressively.	Life of program
BRD	<u>BRAKE DIE</u> - A tool used for various types of forming that is made to be used in the power brake. Generally used to form straight-line bends in heavy aluminum and steel material.	Life of program
CDG	<u>CAD DETAIL GEOMETRY</u> - The CAD Detail Geometry is an electronic control tool representing the manufactured configuration of an extrusion component. The tool features part profile, holes, joggles, and excess material as defined by the Manufacturing Engineering Plan.	Infinity
CF	<u>CHECK FIXTURE</u> - A fixture that is used to check key manufacturing points or detail parts on aircraft assemblies.	Life of program
CG	<u>CAD GEOMETRY</u> - The CG is an exclusively electronic tool that contains geometric information, manufacturing information or both necessary to the fabrication of a part or tool relative to the process being performed. The CG tool may contain 2-dimensional Cad, 3-dimensional Cad Geometry, text, or all to define conditions governing the part or tool configuration as defined by the work order. While the initial use of the CG tool will be to grandfather preexisting flat pattern shapes into electronic secured files, its use is not limited to that function alone. The CG tool may well be used for the geometric control of 3-Dimensional machined parts relative to specific machining operations or a number of similar applications that are not presently covered by a specific tool code.	Infinity
CGNT	<u>CAD/CAM GEOMETRY NO TOOL</u> - A CGNT is an electronic control tool that depicts a finished sheet metal detail component's flat pattern geometry. CGNT illustrates and provides verbiage as needed, net trim periphery, if excess is required, and features that will be formed/fabricated into the component per engineering data (drawings, loft, models) as defined by tool work order. CGNT is used to establish/control the geometry and/or function of a component's tool family (e.g. NCL, HB, DJ, etc.). CGNT is also used as an aid to inspect parts and as a coordinating media for mating parts and tools.	Infinity
CGPL	<u>CAD GEOMETRY PLY LAYOUT</u>	
CMP	<u>COORDINATE MEASURE PROGRAM</u> - A Cordax N/C program used to establish machined parts acceptance to engineering and loft drawing requirements.	Infinity
CMT	<u>CHEMICAL MILLING TEMPLATE</u> - Used to mark areas to be chem. milled. The tool will include set back. It may be used to mark several different chemical steps.	Life of program
CST	<u>CROSS SECTION TEMPLATE</u>	
CT	<u>CONTOUR TEMPLATE</u> - A template used for checking the contour of a part. A cross-section view is placed on the template to clearly indicate the application of the template to the part.	Life of program
DD	<u>DIMPLE DIE</u>	
DF	<u>DRILL FIXTURE</u> - Use drill jig (DJ) tool type.	Life of program
DHB	<u>DRAW HYDRO BLOCK</u> - This tool is a block over which sheet metal is formed to a definite shape. The forming is done by a combination of pressure applied through a confined fluid filled bladder and a draw action brought on by the block moving up into the bladder in a controlled fashion.	Life of program

<u>TOOL CODE</u>	<u>DEFINITION</u>	<u>Average Tool Life</u>
DHBR	<u>DRAW HYDROBLOCK RING</u> - This tool is a flat cylindrical plate which provides a draw surface for the Cincinnati Fluid Cell Press. A cutout in the center coordinates to a Draw Hydro Block. Sheet metal is drawn across the top surface of the ring as the DHB is forced deeper into a pressurized fluid bladder thereby forming the part around the DHB.	Life of program
DHD	<u>DROP HAMMER DIE</u>	
DJ	<u>DRILL JIG</u> - A jig that holds work or is clamped to the work for drilling operations. Usually it has drill bushings while a DF does not.	Life of program
DLT	<u>DEVELOPED LAYOUT TEMPLATE</u> - A template that is used to fabricate and inspect flat pattern parts and parts having bonds or offsets which can be developed by layout methods. A DLT will show hole locations and sizes, chamfer, countersink, spotface, etc. information. Tool code is no longer fabricated, use CGNT tool code.	Life of program
DMG	<u>DIGITAL MASTER GAUGE</u> - A digital rendition of a physical master or transfer gauge stored in CATIA geometry. It is used to record deviation between the engineering values of control points and the actual values of the control points on the master or transfer gauge.	Infinity
DP	<u>DRILL PLATE</u> - Used to control rivet spacing, pattern and edge distance for holes to be drilled to join two or more parts together. Holes can be bushed or un-bushed depending on the type of drill to be used.	Life of program
DRD	<u>DRAW DIE</u> - A die used to draw material between a draw ring and die surface into a definite shape. Used on parts with deep enclosed shapes and/or having long flanges. A DRD requires excess and needs a subsequent operation to obtain net profile. Omit holes prior to forming.	Life of program
DT	<u>DRILL TEMPLATE</u> - Same as a drill plate except a lighter version. Can be a temporary drilling aid or could be used for drilling out a single part.	8 Years
DTC	<u>DETAIL TUBE CONFIGURATION</u> - DTC is a physical representation of a tube that is not complete to final engineering configuration (primarily end fittings/bosses are omitted from tool) and/or tool's tube material deviates from titanium tube part type design.	Life of program
ECMM	<u>ELEC COORDINATE MEASURE PROGRAM</u> - The ECMM is a CATIA model created from engineering, loft and/or MDM data set. This model will initiate a Cordax N/C program (CMP) used to establish machined parts acceptance to engineering and loft drawing requirements. This tool will be stored in the CATIA INRL (Inspection Release) MAP database.	
EFT	<u>EXPERIMENTAL FIVE-AXIS TAPE</u>	
EMM	<u>ELECTRONIC MASTER MODEL</u> - An EMM is an electronic 3-D tooling model residing in aircraft model space that is used to regulate various types of tooling and electronic models.	Life of program
ERT	<u>EXPERIMENTAL ROUTER TAPE</u>	
ETE	<u>ELECTRICAL TEST EQUIPMENT</u> - A tool designed to test a wired electrical assembly for electrical integrity as defined by engineering or user drawings. Tools used to simulate actual routing of a wire bundle assembly in an ACFT and/or to functionally test the assembly to insure functional conformity to specifications.	
FAJ	<u>FLOOR ASSEMBLY JIG</u> - A jig used to locate parts, sub-assemblies and major assemblies in correct location for drilling and riveting.	Until destroyed
FB	<u>FORM BLOCK</u> - A form tool used to hand bend sheet metal parts.	Life of program
FD	<u>FORM DIE</u> - A forming die is used to bend, form, draw or contour sheet metal or extruded sections. These dies, in general, are used in hydraulic or mechanical power presses, usually for parts with flanges less than 1" in length. To form a closed flange requires a subsequent hydro form or hand form operation. Holes may be in blanks prior to forming net blanks can be developed.	Life of program
GF	<u>GRIND FIXTURE</u> -	
HB	<u>HYDROPRESS BLOCK</u> - A hydro block is a block over which sheet metal is formed	Life of program

<u>TOOL CODE</u>	<u>DEFINITION</u>	<u>Average Tool Life</u>
	to a definite shape in a hydro-press. The forming is done by pressure applied through a confined rubber pad or fluid filled bladder.	
HCPT	<u>HONEYCOMB CORE PROFILE TEMPLATE</u> - Used to define profile and/or edge features of honeycomb core for composite parts.	Life of program
HD	<u>HAMMER DIE</u> - A Hammer Die is a forming tool consisting of a punch usually made to the inside contour of a part and die made to the opposite side. The Punch is Actuated by the inertia of its own weight falling or is driven downward by compressed air so as to form sheet metal parts by means of impact. The Hammer Die is used in connection with a drop hammer machine for forming parts of sheet metal. Occasionally used for a forming operation on a part that has been previously partially formed by some other tool. In special applications may be used for forming extrusions or other sections. Machine both male and female tool. All HD's should be a machined matched set (male punch and female die). The practice at TAI is to make the dies out of Kirksite.	<u>Kirk on Kirk</u> -20 years; <u>Lead on Kirk</u> -20 parts before rework, whole tool with rework-300 parts; <u>Urethane</u> - 100 parts before rework; whole tool With rework-20 Years
HF	<u>HOLDING FIXTURE</u> - A design tool used to hold a part in proper orientation for the entire machining process. Can also be a non-designed tool.	Life of program
HFB	<u>HAND FORM BLOCK</u> - A Form Block is used for low production forming of parts and finish forming of parts which had been partially formed by the hydro press, drop hammer, etc. A Form Block is used in hand forming material. This hand forming may be done by forming the material over the block or by the block holding the material while it is hand formed.	Life of program
HM	<u>HYDRAULIC MULE</u> - Any item used to add hydraulic fluid, cycle systems and leak Test aircraft parts and components.	Life of program
HRF	<u>HAND ROUTER FIXTURE</u> - A Hand Router Fixture is used to hand rout cutouts, skins, and sheet parts or assemblies. HRF's are generally located from previously drilled holes, but may be located from other parts or assemblies. Holes may be included if required. An HRF usually includes a backup plate attached to a floor stand.	10 Years
IG	<u>INSPECTION GAGE</u> -	
ILT	<u>INTERMEDIATE LAYUP TOOL</u> - An ILT is used to make a permanent mold or lay-up tool constructed of composite material.	Life of program
IM	<u>INJECTION MOLD</u>	
JD	<u>JOGGLE DIE</u> - A Joggle Die is used in the forming of an offsetting operation, usually performed on a mechanical press. These dies are generally in the shape of blocks which form the required joggle. These dies are usually made from tool steel.	Life of program
JDI	<u>JOGGLE DIE INSERTS</u> - Joggle die inserts are special blocks for a specific part to be used in a standard die set. Consult standard tool list for existing joggle die inserts.	Life of program
KB	<u>KIT BOX</u> - A storage device to hold loose articles necessary for accompanying tool functions.	Life of program
KD	<u>KNIFE DIE</u> - Knife Dies are used for blanking out profiles in sheet rubber, cork, and other compositions having comparative low production requirements.	Life of program- With resharp
LBT	<u>LOCATING BLANK TEMPLATE</u> - A LBT is used to provide a positive location of the bend on small straight line bend parts that only have one flange.	
LF	<u>LATHE FIXTURE</u> - A Lathe Fixture is fastened to a face plate, held in the chuck, or mounted directly on the spindle of a lathe.	Life of program
LJ	<u>LOCATING JIG</u> - A Locating Jig is used to represent or hold parts for their installation.	Until destroyed
LNCL	<u>LASER NUMERICAL CNTL LIBRARY</u> - Laser Numerical Control Library tool is the machine code used specifically by the laser profile machine to cut the periphery, cutouts and holes. LCL is controlled by DLT, CDLT, CG or CGNT geometry. Material thickness is variable between .012" and .500".	Infinity
LP	<u>LOCATING PLATE</u>	
LT	<u>LAYOUT TEMPLATE</u>	

<u>TOOL CODE</u>	<u>DEFINITION</u>	<u>Average Tool Life</u>
MAJ	<u>MODULAR ASSEMBLY JIG</u> - Tooling concept whereby the sub-assemblies are held and transported from one operation to another within the same tool, until the entire aircraft is mated together. Movement from one station to another can be via casters, air pads, or overhead hoist.	Until destroyed
MD	<u>MOLDING DIE</u>	
MDM	<u>MANUFACTURING DETAIL MODEL</u> - A MDM is an electronic control tool representing a machined type component configuration in a 3-D space model. It is to be made from engineering geometry with manufacturing features added, such as allowing for plating, addition or omission of holes, etc. All data required for the machining and manufacturing of the detail that is represented.	Infinity
MF	<u>MILL FIXTURE</u> - A Mill Fixture is fastened to the table or held in a standard utility vise of a milling machine for holding parts while they are milled. May include soft jaw inserts for vise.	Life of program
MG	<u>MASTER GAGE</u>	
MHLT	<u>MASTER HOLE LOCATION TEMPLATE</u> - This is used for coordinating two or more tools which must be interchangeable in respect to hole locations of a non-critical nature.	Until destroyed
MIT	<u>MISCELLANEOUS TOOL</u> - A MIT is a tool which cannot be identified under any other tool codes. This tool code should be used as a last resort.	Life of program
MKO	<u>MECHANICAL KNOCK-OUT DIE</u> - A press plate die (PRP) with a mechanical knockout. Same construction as a press plate die, stripper is mechanical (instead of a piece of cork).	Aluminum-Life of program; Steel - 10 years
MM	<u>MASTER MODEL</u> - A Master Model is a rigid and accurate model of a production part, assembly, or section of the airplane at its critical contour and or attaching points. MM's are used for making and setting other tools or gauges.	Life of program
MMP	<u>MODULAR MACHINE PLATE</u> - Aluminum plate machined to hold close tolerance +/- .001 on thickness, incorporating the standardized 2.0" hole pattern used by TAI machine shop. A minimum of (2) close tolerance tooling hole required for location (ref material: CTS-001, TAI Tool Standard).	Life of program
MOLD	<u>MOLD (GLASS LAY-UP)</u> - A tool used to fabricate complex surface parts such as paraplax or play lay-up to provide the surface lay-up fiberglass or create the mandrel.	<u>Aluminum</u> - Life Of program; <u>Fiberglass</u> - 200 Cycles
MT	<u>MARKING TEMPLATE</u> - A marking template is a tool used to scribe or mark parts for trimming operations, ply or punch locations in composite or bond tooling.	Life of program
MTT	<u>MASTER TOOLING TEMPLATE</u> - A Master Tooling Template is used in the construction, setting, and checking of tools. A basic MTT is to loft contour. Tool is 1/2 inch thick and is painted light blue.	Life of program
MUP	<u>MOCK-UP PATTERN</u> - A control tool used for making replacement inserts for tools. The inserts are usually silicon.	10 years (the Inserts go bad)
MVJ	<u>MACHINABLE VISE JAWS</u> - A machinable vise jaw is a purchased detail or set of details which is machined at the designated machining center where it is to be used. The MVJ will be dedicated to the part for which it was developed except for possible opposite parts or if developed for basic machining and squaring of block material.	Life of program
NCL	<u>NUMERICAL CONTROL LIBRARY (TRU)</u>	
NCT	<u>NUMERICAL CONTROL TAPE</u> - A Numerical Control Tape is loaded into the control of the machine to automatically machine the part per engineering and manufacturing requirements.	
NT	<u>NO TOOL</u> - Used to account for labor associated with fabrication of numerous tools	Life of program
OHE	<u>OVERHEAD EQUIPMENT</u> - An OHE is certified load bearing structures used in conjunction with other material lifting equipment for the purpose of moving material by hoisting. OHE's are neither a part of the lifting equipment or the material to be lifted but is a self-contained unit that is intended to secure the load safely to the lifting device (usually an overhead hoist).	Until destroyed

<u>TOOL CODE</u>	<u>DEFINITION</u>	<u>Average Tool Life</u>
OSHF	<u>OVERHEAD SHAPER FIXTURE</u> - This is used to hold parts on the Overhead Shaper for trim operation. The fixture is free to move about the cutter. Relatively soft materials may be machined in this manner.	Life of program
OSP	<u>OFFSET PRINTING</u>	
PBD	<u>PIERCE BLANK DIE</u> - A Piercing and Blanking Die incorporates a blanking operation with the piercing of holes or internal cutouts in the blanks so that both operations are performed with one stroke of a press. Use a PRP for aluminum or alloy steel parts up to .064" thick (except small parts that would not strip from PRP).	Life of program
PCD	<u>PIERCE & CUT-OFF DIE</u>	
PD	<u>PIERCE DIE</u> - A die used to pierce holes or cuts in a detail part. Generally used for standard cut outs such as latch openings.	Life of program
PFT	<u>PROFILE TEMPLATE</u> - A profile template is used with a machine tool utilizing a tracer control system as a guide for machining or torch cutting the profile outlines of irregular shapes. It is used to shape the outline or contour of a part or portion of a part.	Life of program
PI	<u>PRODUCTION ILLUSTRATION</u>	
PME	<u>PORTABLE MISCELLANEOUS EQUIPMENT</u> - Used to transport aircraft parts, Assemblies, and sub-assemblies throughout the manufacturing process.	Until destroyed
PM	<u>PHYSICAL MODEL</u> - A PM is a physical tool used to produce a variety of tools fabricated through conventional means. Its surface is regulated by an EMM (http://mts_01.cessna.textron.com/E5806Fiels/website/htdocs/mtsinfra1/tops/toolshtm/emm.html) or engineering model. It can represent a production part, assembly, or a specific area of the airplane. A PM is usually a physical reproduction of the EMM surface but may deviate as needed to best accommodate tool fabrication. Where deviation from a coordinating EMM is required the TWO will define the location and amount.	Life of program
PRP	<u>PRESS PLATE DIE</u> - A die used for blanking light gage sheet metal parts, usually not over .091 aluminum or .036 steel and may contain pierce punches, cork, or rubber strippers.	<u>If used on Steel-</u> 10 years; <u>If used on Aluminum-</u> Life of program
PRT	<u>PIN ROUTER TEMPLATE</u> - A template used as a guide to cut or trim parts with a fixed overhead router or shaper by moving the part and tool about the router cutter (5/16 dia.) and guide (1/8 offset).	20 years
PT	<u>PUNCH TEMPLATE</u>	
PTD	<u>PUSH THROUGH DIE</u> - Use PBD tool code	
RACK	<u>RACK</u> - A rack used to store items.	Until destroyed
RB	<u>ROUTER BLOCK</u> - A router block is used on the broken arm table router for guiding the cutter in producing sheet metal blanks. Router blocks should be used for routing only; however a maximum of 10 drill bushings may be put in.	
RDT	<u>ROUTER DRILL TEMPLATE</u> - A Router Drill Template is used as a guide for drilling parts with the broken arm router drill head.	
RJ	<u>RIVETING JIG</u> - A jig used to rivet two or more parts together. The parts usually have holes already and are clecoed together and riveted up.	Until destroyed
RT	<u>REFERENCE TOOL</u>	
RWJ	<u>RESISTANCE WELD JIG</u> - Used to hold parts while being resistance welded or "spot welded".	Life of program
SA	<u>SHOP AID</u> - The tool is used for an aid in the setup and fabrication of detail parts.	Life of program
SB	<u>SPINNING BLOCK</u> - A block used to control the internal shape of a detail part during the spin forming operation. Parts which require SB must be circular.	Life of program
SBX	<u>STORAGE BOX</u>	
SE	<u>SPECIAL EQUIPMENT</u>	
SF	<u>SAW FIXTURE</u> - A Saw Fixture is used in the performance of a sawing operation.	Life of program
SHA	<u>SHOP AID (ELECTRICAL TOOLING)</u>	

<u>TOOL CODE</u>	<u>DEFINITION</u>	<u>Average Tool Life</u>
SHF	<u>SHAPER FIXTURE</u> - A fixture used for machining operations performed on a Vertical Spindle Shaper. The Shaper Fixture is free to move about the cutting tool. Aluminum, aluminum alloys and other relatively soft metals and material are machined on the Vertical Shaper.	Life of program
SOT	<u>SOFT TOOL</u> - A tool used for limited production and cost should be considered.	Life of program
SP	<u>SAMPLE PART</u> - A part that is an actual part that has been painted red, identified by part number and tool number with an electrical pencil. Also, the tool tag attached must be removable. The SP is used to aid the fabrication shops in setting up various operations.	Life of program
SPT	<u>SAMPLE PART TEMPLATE</u> - Is a representation of the actual part in its "as machined" configuration. The tool is used to aid in set-ups and inspection of various operations. SPT is similar to SP with exception: SPT configuration is established through direct coordination with and electronic geometric control tool (predominately CDG), and SPT configuration can be less than that of the finished part's configuration.	Life of program
SST	<u>STOCK SIZE TEMPLATE</u> - Template used to define the raw stock size for detail components. Used when shearing raw material.	Life of program
ST	<u>SPRAY TEMPLATE</u> - Template used to define hole locations and spot welds. Template is applied to assembly to mark the proper location of holes or spot welds with paint.	Life of program
STD	<u>STRETCH DIE</u> - A block over which material is stretched beyond the yield point so that it takes a permanent set. STFB's are made for sheet metal stretch presses.	Life of program
STF	<u>STRAIGHTENING FIXTURE</u>	
STFB	<u>STRETCH FORM BLOCK</u> - A block over which material is stretched beyond the yield point so that it takes a permanent set. STFB's are made from extrusion wrapped round stretch presses.	Life of program
SUT	<u>SETUP TEMPLATE</u> - A template that is used for setting up punches etc. for hole locations, cutouts, etc. on a brake press.	Life of program
SWD	<u>SWAGING DIE</u> - A die that is used for reducing the diameter of tubing and for attaching cable terminals to cables by flowing the terminal material around the cable. In addition it is used to swage ends of tubes for attaching ferrules. This type of die is generally used on a swaging machine rather than on a press.	Life of program
TD	<u>TRIMMING DIE</u> - A die that is a tool consisting of a punch, the cutting edge of which conforms to the outline requiring trimming and a means of maintaining alignment and provisions for a part to be placed between the punch and die unit. The part is blanked to an exact outline by the shearing action of the punch edge being forced by the edge of the die. The trim die is used in connection with a punch press machine for trimming parts that have been formed from sheet metal where the total quantity of parts to be trimmed warrants the construction of a die and where the material is suitable for blanking. This is similar to a Blanking Die, but may also have contour.	Life of program
TJ	<u>TRIM JIG</u>	
TPD	<u>THEODOLITE POINT DATA</u> - TPD is a collection of 3D measured points with X, Y, and Z coordinate values obtained with the Theodolite Measuring System for the critical areas of a quality assurance 'accepted' physical tool. TPD is used to perform periodic validation requirements on the respective physical tool.	Infinity
TRG	<u>TRANSFER GAGE</u> - A master gauge represents an aircraft part. A transfer gauge represents a master gauge. If a MG represents IML of a part, a TRG could represent OML.	Until destroyed
TSJ	<u>TEST JIG</u>	
VJ	<u>VICE JAWS</u> - Tools used to hold extruded parts during the machining process. The jaws fit into a standard vice setup.	Life of program
VM	<u>VACUUM MOLD</u> - A mold used to form plastic parts. Blanks are preheated and formed by creating a vacuum between the mold and the blank.	Life of program
WB	<u>WRAP FORM BLOCK</u> - A tool used to stretch tubing into a circular configuration.	Life of program

<u>TOOL CODE</u>	<u>DEFINITION</u>	<u>Average Tool Life</u>
WHB	<u>WIRE HARNESS BOARD</u> - A tool used to fabricate wire bundles of varied complexity to form assemblies to fit in an aircraft accurately and includes breakout points, wire lengths, termination points and information relating to part number and installation drawings.	
WJ	<u>WELD JIG</u> - A jig that is used to hold parts for arc or gas welding so that warpage is minimized and tolerances are maintained. Torch brazing also requires this tool.	Life of program
WJT	<u>WATER JET TEMPLATE</u> - Template used to define the profile of a part cut on a water jet. Must accompany an 8 inch set back.	Life of program

SECTION D

HIGH-TEMPERATURE COMPOSITE & PLASTIC TOOLING

Technical requirements

D-1. **Scope**

- D-1.1 This section applies to those tools required to fabricate high-temperature composite parts, where “high temperature” refers to the part temperature required to completely polymerize a fiber-resin matrix which is 150 degrees F or greater.
- D-1.2 This section will include those technical requirements TAI views as critical to composite tooling, whether the final tool is metal or plastic.
- D-1.3 In addition, TAI will provide technical requirements for interim high-temperature patterns that Produce final composite tools where the composite tool is of a plastic tooling variety (i.e., GR/EP, FG/EP).

D-2. **Tool Design, Methods, Materials, and Procedural Requirements**

- D-2.1 Tool designs shall be reviewed and approved by TAI Tool Design for correct coordination and technical adequacy as applicable for those tools that represent final bond tools and/or high-temperature patterns.
- D-2.2 Materials used for bond tools and high-temperature patterns shall be reviewed and approved by TAI Manufacturing Engineering prior to actual tool fabrication. Where metal materials are employed as the primary bond tool material, the supplier shall submit a written statement justifying its use as bond tool material.
- D-2.3 The supplier shall produce written methods describing the following critical sub-operations in Fabricating bond tools:
 - 1. Method by which tools are leak checked. TAI’s expectation is 3in/5min. leak rate.
 - 2. Method(s) for installing tooling bushings in laminated bond tools and laminated high-temperature patterns.
 - 3. Method for “tie-in” of support structure (egg-crate) on laminated high-temperature patterns.
 - 4. Method or standard for installing lifting provisions in metal and plastic bond tools.
 - 5. Method of verifying machine-generated surfaces that are contour related.
- D-2.4 Where laminated bond tools are required and are constructed from prepreg or wet-laminated forms, the supplier shall submit a procedural document that describes the details of laminating a bond tool for TAI Manufacturing Engineering and approval. This document shall have no less than the following specifics:
 - 1. Tool release operations;
 - 2. Surface coat and laminating operations;
 - 3. Ply material tables describing ply count and orientation;
 - 4. Compacting and bagging operations;
 - 5. Cure and post-cure operations; and
 - 6. Description of support structure tie-in operations or references to the appropriate standard.
- D-2.5 TAI has various documents that explain how they build their tools. If you would like to see something with detail of our practices please contact your Supply Chain representative and they will contact Tool Engineering.