

 Sikorsky Aircraft

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 This document establishes supplier responsibilities in the procurement, acquisition, manufacture, receipt, acceptance, storage, control maintenance, transfer, handling, accountability and disposition of Special Tooling. It further establishes requirements for records and reports related to the maintenance and disposition of these tools. The responsibilities outlined herein are mainly extensions of Sikorsky’s DOD prime contractual requirements and applies fully to all Purchase Orders in which it is incorporated unless specifically modified or restricted therein.

Sikorsky Tooling Bulletin

[Supplier Tooling Requirements]

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\* Any changes made to this bulletin must be approved by the Sikorsky Durable Tooling Manager and Supplier Quality Assurance.

Reference

Documents

 AS9102 – First Article Inspection Requirements

PR:03-02-136 Z- Tooling

SA0557 - Sikorsky Aircraft Supplier Tooling Request Form

 SA5400-3 – Worn, Damaged or Obsolete Special Tooling

SA5409 - Supplier Certification of Completion

 SA7766 – Out of Service Tag

SA8239 - Notice of Transfer – Subcontractor Tooling

 SA8500 - Tool Recall Notice

SA8501- Request for Tool Shipment

 SD1.145 – Standard Tool Design Manual – Title Block Requirements

1. DEFINITIONS:
	* CONTRACTOR ACQUIRED PROPERTY (CAP): Property acquired, fabricated or otherwise provided by Sikorsky Aircraft (the CONTRACTOR) for performing a contract and to which the Government has title.
	* GOVERNMENT-FURNISHED PROPERTY: Property in the possession of, or directly acquired by, the Government and subsequently furnished to Sikorsky Aircraft for performance of a contract.
	* GOVERNMENT PROPERTY (GP): All property owned or leased by the Government. Government Property includes both Government-furnished and CONTRACTOR acquired property.
	* MEDIA OF INSPECTION (MOI) TOOL: Tool used to validate product to verify compliance to engineering requirements. MOI tools require initial validation and periodic validation if they are subject to wear.
	* MEDIA OF INSPECTION (Z-MOI) TOOL: Tooling made to the supplier’s design or specifications used to inspect Sikorsky parts. Z-MOI tools require initial validation and periodic validation if they are subject to wear.
	* PERIODIC VALIDATION: Examination of tool features, which could affect product conformance due to wear at established intervals.
	* PERISHABLE TOOLS: Catalog items readily available on the open market, which because of their size and nature, are considered expendable. Drills, reamers, taps, snap gages and all types of cutting tools are considered perishable tools even though they are altered for production purposes and may be special in nature, unless they are otherwise determined to be accountable. The Supplier is expected to provide all universal shop equipment; these articles are not to be included in tooling quotations.
* SAP EQUIPMENT MANAGEMENT SYSTEM: Process put in place by Tool Engineering to uniquely identify, build, inventory and maintain durable tools.  Tools requiring periodic validation will have inspection plans maintained for them to allow the system to recall them automatically for review.
* SHOP EQUIPMENT AND DURABLE TOOLS: Plant equipment required for production tools and parts, such as machines, motors, cranes, utility dollies, hoists, adapters and furniture. It will also include all equipment, instruments and tools used in manufacturing, operating, constructing and testing activities that are not classified as “Special Tooling”. The Supplier is expected to provide all shop equipment; these articles are not to be included in tooling quotations.
* SIKORSKY TOOLING: Tooling manufactured per the STM (Sikorsky Tooling Manual) or to a Sikorsky tool designs and are categorized as "T" tooling.
* SPECIAL TOOLING (ST): Includes Jigs, Dies, Fixtures, Molds, Patterns, Gages, and other equipment and manufacturing aids which are specifically developed to produce a part or provide a service.

The term includes all components of such items but, does not include:

* + - Consumable property
		- Special test equipment
		- Buildings, non-severable structures (except foundations and similar improvements necessary for the installation of Special Tooling), general or special machine tools or similar capital items
		- Software
		- Perishable tools
		- Shop equipment and durable tools
		- Supplierowned tools
* STANDARD TOOLING (STD): A tool designed and fabricated to be generic in nature which has potential for broad application. Its use is not restricted to a specific part number or family. Standard Tooling includes but not limited to the following: measuring instruments, gages, or micrometers. Cutting tools such as drills, reamers, milling cutters, thread cutters, taps, gear cutters, or broaches. Catalogue holding device, arbors, or collects. General purpose machine tools and equipment.
* SUPPLIER-OWNED TOOLS: Forging and extrusion dies and molds for permanent mold castings (T080 or Z080) are the property of the supplier with exclusive usage rights belonging to Sikorsky Aircraft. Design records are maintained within SAP at Sikorsky. Supplier-owned tools shall be noted separately on tooling quotations even though by reason of supplier retention they do not fall within the definition of accountable tools.
* SUPPLIER TOOLING: Tooling made to the supplier’s design or specifications used to produce Sikorsky parts. These tools are categorized as "Z" tooling.

3.0 COMPLIANCE:

In the event this document is incorporated by Purchase Change Order to an existing Purchase Order, the Supplier shall conform to these requirements within 30 days from the issuance of the Purchase Change Order unless otherwise specified.

4.0 ACQUISITION OF Z TYPE TOOLING:

Pursuant to the requirement of the Sikorsky Request for Quotation, the Supplier, when quoting on tooling, must submit the list of required Special Tools for approval on form SA0557 “Sikorsky Aircraft Supplier Tooling Request Form” to the Sikorsky e-mail eng\_tool\_request.gr.sik@lmco.com and copy the Sikorsky Buyer.

* The Supplier shall be responsible for procurement, maintenance and inspection (at their own expense) of all Standard Tooling (other than spline gages).
* Sikorsky shall authorize the Supplier to fabricate the "Z" tools by a Purchase Order and Sikorsky shall supply the identification tags to the Supplier to be affixed on the tooling.
* Prior to making any substitutions and/or changes on the tools listed on an approved tooling purchase order, the Supplier shall obtain written authorization from the Sikorsky Buyer.

5.0 ACCEPTANCE OF Z TYPE TOOLING:

* Upon acceptance by Sikorsky Inspection of the "First Article" produced by the tooling, the Supplier shall submit photographs of the completed "Z" tools including a close-up of the tool identification tag permanently affixed to the tool to Sikorsky e-mail eng\_tool\_acceptance.gr-sik@lmco.com and cc the Buyer for review.
* The Supplier shall submit an invoice to the Sikorsky e-mail eng\_tool\_acceptance.gr-sik@lmco.com and copy the Buyer upon acceptance of the First Article. The invoice must include: the tooling P.O. number, line item number, tool description, tool number (stamped on tool), and individual price. It is acceptable to show only the total amount on the invoice and list the detail on a breakdown and attached to the invoice.
* Z-MOI tools require a design to be submitted to and reviewed by Sikorsky.
* Z-MOI design shall describe all the MOI features of the tool
* Current 3D Computer Aided Design (CAD) software or equivalent should be used to create tool geometry.
* The design should be in SAC’s tool design format or equivalent and show all MOI controlled features along with isometric views of the tool.
* Standard tooling design practices should be used to develop a tool that is robust and can be used to produce accurate SAC parts 100% of the time
* Communication with a SAC Tool Engineer is recommended during the tool design process to resolve any questions or issues that may arise. Forward questions to eng\_tool\_acceptance.gr-sik@lmco.com.
* SAC Tool Engineering to provide any supporting data or coordinating tooling information in support of the Supplier’s tool design and fabrication processes.
* All MOI features will be identified with the symbol:              on the tool design drawing. These features will be inspected and verified by SAC or certified by the Supplier and validated by SAC prior to tryout.
* MOI feature type, location, and feature requirements will also be identified on the tool design drawing under a MOI Features Table.
* The MOI Features Table must also allow space to record dimensional values identified after each validation for at least 5 cycles.
* MOI tooling tolerances are derived from engineering tolerance requirements and tool type, typically:
	+ - 10% for gages
		- 25% for precision tools
		- 50% for airframe assembly fixtures
* Supplier shall schedule a design review with SAC Tool Engineer.

 6.0 IDENTIFICATION OF “T” AND “Z” SPECIAL TOOLING:

Special Tooling will be identified according to the Sikorsky Aircraft tool identification criteria listed below and in accordance with STM SD-1-415.

 **The physical tool must be identified with the tool number.**

* Identification must be applied to each tool in the manner specified on the Design Order (TDO).

Acceptable means of identification of a tool:

* The preferred method is to Impression stamp directly on a metal tag, that is attached to the Tool. Tag to be riveted in a prominent location, so as not to

Interfere with the operation of the tool or with the installation of a part or assembly. If this is not Feasible, then attach the tag to the tool with a wire, or nylon cord, with the same restrictions.

* Impression stamping directly on the physical tool is acceptable if it can be accomplished in a conspicuous area, not interfering with the Locating surfaces.
* Etching or engraving directly on the physical tool in an obvious area and not on a locating surface.
* Painting the identification on the physical tool, again not on a locating surface, in letters large enough to be easily read.

Other identification requirements.

* + To obtain proper markings of the storage box, refer to STM SD-1-410 for storage box types.
	+ All identifying markings are subject to examination as Sikorsky deems necessary.
	+ Sikorsky tool code identification and part numbers shall be shown on all inventories, shipping documents, receiving reports and other records relating to the tool. When Sikorsky buys a tool, it needs to be listed in the supplier’s operation sheets.
* Supplier having an established system of tool identification may use their system as well as the Sikorsky system if the markings of the supplier system are identified as such. In this event a cross reference must be kept of supplier numbers and Sikorsky tool code letters and part numbers.
* Special Tooling shall be assigned identifying numbers; contact your buyer.
* Tool code letters shall be suffixed to the engineering drawing part number or production assembly number, whichever is applicable.
* When two or more tools are assigned the same tool numbers and code letters are to perform successive operations on the same numbered part, the tools will be successively identified by sequence use.
* Contact your buyer for alpha numeric suffixes for duplicate tools.
* When a tool is composed of more than one component or detail, each detail will be identified with a detail number.
* All tool rework required by engineering changes will be documented and retained at time of rework by indicating the engineering order number, drawing revision or other engineering authorization number or code to which the tool is reworked.
* Rework of Special Tooling due to engineering design changes must be certified by completion of SA5409 “Supplier Certification of Completion”.
* MOI tools require a SA5409 form and a final inspection report indicating conformance to the tool design. Both shall be sent to eng\_tool\_acceptance.gr-sik@lmco.com.
* Tool code letters shall be suffixed to the engineering drawing part number or production assembly number, whichever is applicable.

Z-Tool Identification Format

* The maximum length for all tool numbers is twenty-five (25) characters including part numbers.
* The Part Number will be established in the first fifteen (15) positions of the tool number, including dashes. Example: XXXXX-XXXXX-XXXZ012
* If the Part Number contains four (4) characters before the first dash, a preceding “S” should be inserted. Example: XXXX-XXXXX-XXX should be written SXXXX-XXXXX-XXX

Tool Identifier – “Z” Number

* “Z” type tooling is fabricated by a Supplier in accordance with their design specifications and used to fulfill a Sikorsky Aircraft Corporation’s (SAC) purchase order for parts, components, assemblies, etc. “Z” type tooling is identified with a “Z” and parallels the existing SAC “T” type numbering system. Example: XXXXX-XXXXX-XXXZ012

Series ID Number

* A tool with the same part number and tool number as the first in the series but differs in form or function must have a decimal point followed by two (2) digits. Example: XXXXX-XXXXX-XXXZ012; XXXXX-XXXXX-XXXZ012.02

Note: The second tool in the series is to be identified as “.02” rather than “.01” because the first tool in the series is always considered to be .01.

Duplicate Tool Suffix

* Tools which are identical must carry identical part numbers, tool numbers, and series. To differentiate between the tools a suffix letter designation is assigned in the following manner.
	+ - The first tool will not be assigned a letter.
		- The first duplicate tool (second tool) will be assigned the suffix “A”.
		- The second duplicate tool (third tool) will be assigned the suffix “B”, and so forth as illustrated in the following example.

Example: 22222-22222-222Z063 (First Tool); 22222-22222-222Z063.00A (Second Tool)

22222-22222-222Z063.00B (Third Tool)

Series Numbers

Example if a series number applies:

33333-33333-333Z078.03; 33333-33333-333Z078.03A; 33333-33333-333Z078.03B

Example if the total number of duplicate tools exceeds the alphabetical limit:

44444-44444-444Z078.00AA; 44444-44444-444Z078.00AB

Example if the total number of duplicate tools exceeds the second alphabetical limit:

44444-44444-444Z078.00AAA; 44444-44444-444Z078.00AAB

Do not use the letters “I” and “O” in the duplicate numbering system.

Molds (Z060) use “.00E” Electroformed Nickel Mold, “.00F” Elastomeric (Black Bag), and “.00M” Metal Mold to indicate mold type, not duplicates.

Example:

55555-55555-555Z060.00E - Electroformed Nickel Mold

55555-55555-555Z060.00F - Elastomeric (Black Bag)

55555-55555-555Z060.00M - Metal Mold

Example if Z060 is a duplicate tool:

12345-67890-123Z060.00EA

12345-67890-123Z060.00EB

7.0 CHANGES (REWORK or REPLACE):

If it becomes necessary to rework or replace a "Z" tool during implementation of the purchase order due to a Sikorsky directed configuration change. The following steps should occur.

* A delta or a full FAI must be performed.
* Supplier is responsible to submit a SA0557 “Sikorsky Aircraft Supplier Tooling Request Form” form to Sikorsky (Purchasing) for approval.
* Upon receipt of authorization (P.O. or supplement) the Supplier shall rework or fabricate the "Z" tooling to the latest configuration.
* All T-Type tool rework or replace shall be sourced to an approved Sikorsky tooling supplier.
* The Supplier must obtain approval from their Sikorsky Buyer for any rework/repair/replace to a Sikorsky Supplied "T" tool that changes the tool. Authorization to implement the change will be communicated via a P.O. or supplement SA0557 “Sikorsky Aircraft Supplier Tooling Request Form.”

8.0 HANDLING, MAINTENANCE & REPAIR:

* + Subject to the rights of the U.S. Government, Sikorsky Aircraft approval must be obtained prior to producing parts from Sikorsky Aircraft Special Tooling for any party other than Sikorsky Aircraft.
	+ During execution of a purchase order, the Supplier is responsible for maintaining in good condition all Sikorsky tooling ("T" and "Z"), as may be required, to assure acceptable part fabrication consistent with contractual requirements.
	+ Maintenance/repair responsibility include but are not limited to: (a.) the replacement of missing or damaged pins, cables, bushings, screws, nut, bolts, clamps, jack screws, washers, vacuum bags, caul plates, locators, form block backing plates, and miscellaneous hardware. (b.) the repair of mold and bonding fixture and form block surface imperfections. (c.) the re-inking and sealing of molds. (d.) the replacement of rubber molds for bonding fixtures. (e.) General cleaning, plating, and painting. (f.) the application of a protective finish to guard against rust to major jigs. (g.) All critical surfaces or edges will be masked and will be treated with an approved rust preventative compound prior to shipping or storage of tool greater than 90 days.
	+ Under no circumstances is a Supplier to duplicate/replace a “T” or “STD” tool, without Sikorsky authorization in the form of a valid PO issued from the SAP Equipment Management System:   Process put in place by Tool Engineering to uniquely identify, build, inventory and maintain durable tools.  Tools requiring periodic validation will have inspection plans maintained for them to allow the system to recall them automatically for review.
	+ The Sikorsky SAP Equipment Management System generates a recall notice bi-monthly for T-Type MOI Tools coming due for periodic validation within the next 60 days. Suppliers not approved or unable to perform periodic validation are to return tool and required information to Sikorsky, to the address found on the recall notice prior to due date.
	+ Supplier may request inactivation of the tool if there is no foreseeable use in production.

9.0 TRANSFERRING OF TOOLS

 SENDER:

* When T-Type tooling is required to be transferred, from Supplier A to Supplier B for production, Sikorsky Buyer will issue form SA8239 "Notice of Transfer- Subcontractor Tooling" to the supplier. The form will indicate where the tooling (including copy of SA8239) is to be shipped. The Supplier shall not transfer Sikorsky tooling without SA8239 (which transfers responsibility for the tooling). When a T-Type tool is available for use from Sikorsky the buyer will issue form SA8501 “Request for Tool Shipment”.
* Prior to transfer all know deficiencies in the tool shall be brought to the attention of the Sikorsky buyer. Examples would include missing details, damage, wear or environmental damage.
* All tooling must be in satisfactory working condition and properly protected against damage before shipping. Sikorsky Aircraft will hold the Supplier responsible and subject to charge for any tools received~~,~~ that will not produce satisfactory parts in accordance with the drawing requirements, due to improper maintenance, handling, storage, packing, or etc.
* For all Tooling recalled to Sikorsky Aircraft or transferred to another Supplier; Sikorsky buyer shall complete SA8500 “Tool Recall Notice” form and send to supplier.
* The Supplier shall furnish, upon request, three (3) copies of complete up-to-date manufacturing operational sheets and pertinent preventative maintenance documents containing information as follows:
	+ - * Operations required to lubricate detail part of assembly
			* Special Tooling used, identified by Sikorsky Aircraft part numbers and tool code letters

 RECIPIENT:

* The Supplier shall acknowledge receipt of Sikorsky supplied tools on the SA8239 "Notice of Transfer - Subcontract Tooling" and return the SA8239 to the Sikorsky Buyer. The Sikorsky Buyer shall send form to the Government Property Tool Control Manager. This is to ensure that the Tooling records are updated accordingly.

* For MOI Tools that require periodic validation (T015, T016, T020, T084, T163, and T316), the Supplier shall verify that (1) the tool has a yellow SA8360-2 “Periodic Proving” sticker affixed to it and (2) the due date has not passed. If the date has passed or is less than 60 days away, see 17.0 Validation Requirements.
* The Supplier shall inspect Sikorsky furnished tooling upon receipt. Any discrepancies and/or questions regarding the potential capability of fabricating acceptable parts using these tools shall be brought to the attention of the Sikorsky Buyer immediately.

10.0 CONTROL OF INVENTORY:

* Supplier shall provide proper storage for all tools its possession during the contract period of performance and until written disposition is obtained from Sikorsky. All tooling must be free of rust and/or other contamination.
* All tooling shall bear marking (identification tags) in accordance with the tooling purchase order.
* Supplier must maintain a perpetual inventory list of all tooling and shall provide Sikorsky a comprehensive listing of all tooling in its possession within ten (10) business days of a request by Sikorsky for such list.
* No storage may be charged for tooling without specific authorization from Sikorsky.
* Supplier will be subject to periodic audit by Government and/or Sikorsky personnel as applicable. The Supplier is responsible and accountable for Sikorsky or Government owned tooling.

11.0 RECORD REQUIREMENTS:

The Supplier is required to maintain adequate control records of all Special Tooling including the following:

* Control Records listing ownership for such Special Tooling and the Purchase Order under which Special Tooling was acquired.
* Accountability in the transfer from one commodity type Purchase Order to another.
* For all tools charged to the supplier; Sikorsky Government property audit group sends out annual physical inventory list during the first quarter of the year. Supplier shall respond to the audit within 60 days of receipt.

Supplier shall identify all tools on the audit documentation that supplier no longer has or no longer needs but is being charged for per the Sikorsky annual physical inventory list.

* Sikorsky packing sheet on which tool was received.
* Sikorsky tool number and code.
* Manufacturing operation sheets.
* Financial control in appropriate general ledger account.

12.0 LIABILITY:

* Except to the extent that the Supplier may be expressly relieved of liability elsewhere in the Purchase Order, Supplier assumes all risk for loss or damage to Special Tooling while in supplier’s ’s possession, custody or control, or in the possession, custody or control of his subcontractors. The requirements for these accountability instructions apply equally to all Special Tools for which a Sikorsky supplier is responsible, regardless of location.
* The supplier utilizing SA5400-3 shall promptly report all cases of lost, damage, destruction of Special Tooling in his possession or the possession of his subcontractors. This provision is in addition to any requirements appearing on Sikorsky’s Purchase Order. Supplier shall notify Sikorsky Government property group and Sikorsky purchasing; refer to the annual tooling inventory documentation for contact information.
* If tooling is lost, damaged, and/or destroyed, Supplier shall provide written notification to the Sikorsky Buyer. The Buyer will notify the Supplier of the action to be taken.
* If "ST" tooling is to be repaired or replaced, it will be at the Supplier’s expense.

13.0 DISPOSITION:

* All Special Tooling, either supplied by Sikorsky, produced or required by the Supplier, shall be retained or disposed of in accordance with the procedure set forth in the Sikorsky Purchase Order under authority of which tools were furnished, purchased, produced or otherwise accountable.
* All Special Tooling will be maintained and stored by the Supplier until formal disposition instructions are received from Sikorsky. Under no circumstances shall Special Tooling be scrapped without prior written authorization from Sikorsky.
* If an engineering change results in a requirement for tool rework, the Supplier shall review the tool to determine appropriate action. Whenever possible, the tool should be reworked to produce the new part and retain the capability to produce the replaced part as well. Rework of Special Tooling furnished by Sikorsky shall not proceed until authorized by the Sikorsky Buyer.
* If the tool cannot be reworked to satisfy both the old and the new configurations, the original tool configuration must be retained if any of the following conditions apply:
* The tool is necessary to control a critical dimension that cannot otherwise be maintained.
* The tool is necessary to guarantee interchangeability or replaceability.
* The tool is necessary to produce a part without the use of special machines that are not available.
* When Special Tooling in the Supplier possession is no longer required, the Supplier will submit to the Sikorsky Buyer form SA5400-3 “Worn, Damaged or Obsolete Tooling” for disposition instructions. Special Tooling will be dispositioned in accordance with Sikorsky / U.S. Government instructions, i.e. conduct sale, scrap or ship to another facility. The Supplier is not permitted to ship or otherwise dispose of any Sikorsky "T", "STD", or "Z" tooling in their position unless prior Sikorsky authorization is obtained.
* When authorization to scrap Special Tooling has been received, the Supplier will proceed to dispose of same through his approved scrap procedures.
* The Supplier shall transfer Special Tooling to another site or to Sikorsky only when authorized by the Sikorsky Buyer. The Supplier will list Special Tooling on all shipping documents in accordance with identification criteria described herein.

14.0 OWNERSHIP OF SPECIAL TOOLING

* Special Tooling either produced hereunder or supplied by Sikorsky are Sikorsky or Government property and will be used only for the fabrication of Sikorsky parts or assemblies under Purchase Orders issued by Sikorsky unless otherwise specified by Sikorsky, subject to the rights of the U.S. Government, Sikorsky approval must be obtained prior to producing parts from Sikorsky Special Tooling for any party other than Sikorsky.
* Title of all Special Tooling provided for use by Sikorsky will remain with either Sikorsky or the U.S. Government, accountable to the Prime Contract and Purchase Order as identified.

15.0 COST RESPONSIBILITY SUMMARY

* The following chart clarifies responsibility for expenses incurred in support of tooling used by Suppliers to fabricate Sikorsky parts.
* \*\*This cost responsibility matrix is applicable for Sikorsky recognized T, Z, D or P type tools. It does not include supplier fabricated NSR – Non-Sikorsky Record tools.

|  |  |  |
| --- | --- | --- |
|  | SA TOOL | COST RESPONSIBILITY  |
|  | BULLETIN | SIKORSKY SUPPLIER | SIKORSKY |
| NEW PART | Paragraph 3.0 |  | X |
| New Design |  |  |  |
| **S/A CHANGES**  | Paragraph 8.0 |  | X |
| Engineering Change Order |  |  |  |
| Manufacturing Engineering |  |  |  |
| Change Ordered (MECO) |  |  |  |
|  | **SA TOOL** | COST RESPONSIBILITY  |  |
|  | **BULLETIN** | **SIKORSKY SUPPLIER** | **SIKORSKY** |
| **SUBCONTRACT CHANGES** | Paragraph 3.0 | X |  |
| Improvements benefiting subcontractor |  |  |  |
| **MAINTENANCE** | Para 6.0, 9.0 | X |  |
| Repair |  |  |  |
| Replace |  |  |  |
| **TRANSFER** | Paragraph 9 | X |  |
| Resource Supplier to Supplier |  |   |  |
| Resource Supplier to Sikorsky |  |   |  |

16.0 SUPPLIER CREATED MOI TOOLING – GENERAL REQUIREMENTS

* Sikorsky prime Supplier must demonstrate their process with applicable records (EO’s, Drawings/models, tool designs, etc.) to demonstrate accuracy, completeness and traceability to the approved Sikorsky Engineering data.
* Supplier shall have a documented training process to assure competence, training records to include on-the-job-training, for all process users involved with MOI tooling (Quality, Tool design & Tool Fabrication). Training records shall indicate proficiency in 3D software that is being utilized by having a minimum 6 months experience with this software.
* Supplier’s operation sheets shall indicate the name of the tool and what features are being inspected with that tool.
* Supplier will ensure that when a translator is used to translate from a Sikorsky released CATIA model to an alternate format (STEP, iges, and prior revisions of the CATIA file) that the resulting tool is accurate to the Sikorsky engineering definition. A clear documented process to verify the accuracy of the translations is required. The supplier shall be able to demonstrate the translation process and the accuracy of the translation. The final product must be within Sikorsky defined engineering tolerances.
* In the event of an engineering change, the MOI tooling supplier must have a system in place that tracks each change to the tool. This change process will not take any longer otherwise contractually required. The supplier tracking system will minimally consist of Revision date, Sikorsky engineering revision and Description of change.
* The MOI tool must prove that it can build an acceptable detail or assembly; a delta or full FAI is required as objective evidence. This requirement will also be met by verifying that the product of the tool coordinates with the next assembly or installation level.
* When a supplier needs a flat pattern for inspection purposes. A Sikorsky T type tool will need to be issued by Sikorsky for those purposes or another means of inspection shall need to be used. Supplier is not to create a flat pattern from a 3D model unless authorized to do so by Sikorsky Supplier Quality.
* MOI tools need to be listed on form 3 of AS9102 with entire part number and tool type.

16.5 MBD MOI MYLAR REQUIREMENTS

The following requirements are to be followed by suppliers who want to inspect parts using a supplier created MOI mylar created from 3D data.

* Supplier needs to be approved to create MOI mylars. Supplier shall submit a procedure addressing all MOI supplier created mylars to below mentioned requirements to Sikorsky Supplier Quality Assurance for review and approval.
* The mylar shall have the approved engineering data revision on it and it must correspond to the engineering revision on the purchase order for the part being manufactured. One document should be maintained for the purpose of recording all changes and revisions for the life of a MOI Mylar tool.
* The tightest product tolerance that can be reasonably inspected with a Mylar is +/- 0.030 inch after performing a grid check. True position tolerances shall be measured by a different measuring method.
* All Mylar’s must have either a measurable grid pattern or target points not to exceed ten inch’s square, vertically and horizontally. Mylar’s should have all applicable views for required inspection; to include appropriate hidden lines and be printed on an appropriate material with minimum thickness of 5 mil.
* All mylars shall be measured prior to each use to validate that the tool has not changed in size since creation. Measurements of the grid shall be taken vertically and horizontally in a minimum of four locations. Mylars should be evaluated for damage and readability. All mylars deemed unusable will be destroyed and recorded as such in the supplier’s calibration system.
* Mylar’s must have a minimum of three dimensions for each part number shown. Length, Width, and Height of the part is required. (detail).
* All MOI mylars shall be noted as “MBD Mylar” sometimes referred to as “Z-MYL Media of Inspection”; and must have evidence of suppliers QA acceptance.
* The equipment (plotter) shall be in a controlled environment to eliminate any variations due to temperature and humidity, and to ensure consistent results and provide a baseline if a mylar is in question. It is recommended that the mylar be used under the same controlled conditions that existed during its fabrication, as this would tend to negate any dimensional changes due to temperature and/or humidity variations. However, when a mylar is to be used outside of the controlled environment that it was created in, the co-efficient of expansion must be applied based on environmental changes.
* Within the temperature range of 70- 120 degrees F. the coefficient of thermal expansion of polyester Mylar film is .00001” per inch per degree Fahrenheit. Mylar also has a slow response to temperature change as compared to metals. Up to 24 hours may be required for full thermal expansion to occur. This thermal expansion could be significant when temperature variations are excessive and the part is long. The following shall be recorded on the Mylar; creation date, Temperature & humidity level of room and page numbers if more than one sheet.
* Although it is generally presumed that Mylars are not exposed to temperatures of 120° or greater, it should be noted that permanent damage may result if Mylar is exposed to high temperature. Shrinkage of approximately .05% will result with extended exposure to temperatures between 120° F and 180° F. Although shrinkage seems to contradict the previously described effect, 120° F is where temperature change no longer expands the Mylar and permanent damage results.
	+ To determine the change in size due to varying temperatures, the following formula may be applied: DC = K x L x TC, where: DC = Dimensional Change K = Thermal Coefficient Factor (.00001) L = Original Length TC = Temperature Change
	+ The humidity coefficient of expansion of Mylar film is in the range of .00001" per percentage of humidity. This factor is applied in the same manner as the thermal coefficient and is subject to the same response time.
* It is important to note that changes in humidity are additive to the effects of temperature regarding dimensional change. Also, by increasing humidity and decreasing temperature or vice versa, one will cancel the other.
	+ EXAMPLE

Mylar is made at controlled atmosphere; 68° F & 35% relative humidity.

Mylar is used in tool room at uncontrolled atmosphere; 88° F & 75% relative humidity.

Length of Mylar; 240".

20° change in temperature x .00001 x 240 in. = .048”

40% change in relative humidity x .00001 x 240 in.= .096”

TOTAL DIMENSIONAL CHANGE = .144”

* The equipment (plotter) is calibrated once a year per OEM requirements, as is the temperature and humidity controller. Calibration records shall be maintained by supplier.
* Mylars shall be stored appropriately to prevent damage from environmental concerns as well as distortion. It is recommended that all mylars be stored in a rolled condition. For the most accurate use, mylar should be allowed to stabilize itself in a relaxed, flat condition for a period of 24 hours prior to its use. Mylars should be evaluated for damage and readability. All mylars deemed unusable will be destroyed and recorded as such in the supplier’s calibration system.
* All mylars shall be measured prior to each use to validate that the tool has not changed in size since creation. Measurements of the grid shall be taken vertically and horizontally in a minimum of four locations.
* Sikorsky prime suppliers who are authorized to make mylars by Sikorsky can authorize and manage their sub-tiers to make MOI mylars. Prime supplier must be approved to make mylars prior to authorizing sub-tiers. It is the responsibility of the prime supplier to manage the sub-tier as it relates to MOI Mylar tools. The prime supplier shall initially audit the sub-tier to the requirements listed in this document and grant an approval letter to that sub-tier stating the acceptance of management and creation of MOI mylars. An annual audit of the sub-tier shall be performed by the prime and all objective evidence of the audit shall be readily available for Sikorsky review.

17.0 VALIDATION REQUIREMENTS

* + T-Type tools (Sikorsky supplied) that can be used as MOI (Media of Inspection) are listed on Table 1. It also lists specific tools that require periodic validation along with their time interval in weeks.
		- The Supplier will receive an email notification twice a month with a listing of T-Type tools due for periodic validation within the next 60 days.
		- When a tool is past due for periodic validation, the Supplier shall attach an SA7766 “Out of Service Tag”, or equivalent to the tool.
		- A Supplier that is approved to perform periodic validation on T-Type tools used in their process shall utilize the SA5994 “Tool Validation Report” and forward their findings to tooling\_info.gr-sik@lmco.com.
		- When a T-Type tool fails validation, the Supplier shall utilize the SA5994 to document tool discrepancies and forward to both tooling\_info.gr-sik@lmco.com and their Sikorsky Buyer. An SA7766 “Out of Service Tag”, or equivalent shall be attached to the tool until it is recalled by Sikorsky or deemed acceptable for use.
		- A Supplier that is not approved to perform periodic validation on T-Type tools shall be provide with a completed SA8500 “Tool Recall Notice” from their Buyer with instructions to return the tool(s) to Sikorsky.
	+ Z-MOI tools shall require initial and Periodic Validation every 52 weeks or more frequently if supporting data indicates the tools require a more frequent validation. Supporting data would be an increase in QN’s, Production issues, Quality problems, Work arounds for production technicians, Escapes to the customer (internal or external), etc.
		- The Supplier is responsible for inspecting the Z-MOI tool and documenting all actual data found during periodic validation under the MOI Features Table on the tool design drawing.
		- The Supplier will generate certification of inspection results at every periodic validation interval and send to SAC for approval as inspection schedule dictates. Suppliers to utilize the SA5409 Supplier Certification of Completion and SA5994 Tool Validation Report or equivalent documents.
		- Supplier is required to conduct periodic validations to Z-016, Z-020, Z-084, Z-0163, Z-316
	+ If a Z-Type tool fails validation, supplier can utilize SA7766 “Out of Service Tag” or equivalent and attached it to the tool until it is deemed acceptable for use.

**TABLES FOR T-TYPE VALIDATION REQUIREMENTS**

TABLE 1 – Media of Inspection (MOI) Tools

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| T-TYPE | TOOL NAME | INITIAL VALIDATION | PERIODIC VALIDATION | INTERVAL (WEEKS) |
| T-011 | Drill Jig (i.e. Sheet Metal) | Yes | No | N/A |
| Drill Jig (i.e. Machine Shop) | Yes | No | N/A |
| T-016 | Drill & Trim Template | Yes | Yes | 72 |
| T-018 | Bonding Fixture (blade tools) | Yes | No | N/A |
| T-019 | Weld Fixtures | Yes | No | N/A |
| T-020 | Checking Tool | Yes | Yes | 72 |
| T-033 | Contour Template | Yes | No | N/A |
| T-035 | Trim and Drill Fixture | Yes | No | N/A |
| T-060 | Composite Part Mold | Yes | No | N/A |
| T-063 | Assembly Fixture | Yes | No | N/A |
| Assembly Fixture (i.e. Machine Shop) | Yes | No | N/A |
| T-084 | Acceptance Gauge | Yes | Yes | 72 |
| T-090 | Drill Plate (i.e. Sheet Metal) | Yes | No | N/A |
| Drill Plate (i.e. Machine Shop) | Yes | No | N/A |
| T-091 | Apply – Drill Fixture | Yes | No | N/A |
| T-163 | Major Assembly Fixture | Yes | Yes | 32 |
| T-316 | Trim Tool | Yes | Yes | 72 |
| T-358 | Digitized Flat Pattern Data (Physical) | Yes | No | N/A |
| Digitized Flat Pattern Data (Vellum) | Yes | No | N/A |
| T-360 | Laser Projection ProgramNote: Electronic Data (no hard tooling). Initial acceptance or modifications will be performed by Process Engineering | Yes | No | N/A |
| T-396 | Electronic Flat Pattern Data | Yes | No | N/A |
| T-462 | Layout Mask (Lines Only) | Yes | No | N/A |

18.0 TOOL STEWARDSHIP

The following must be performed, and records maintained.

* Visually check of tool(s) for calibration data, proper tool numbers and damage prior to use (e.g. broken pins, bent corners) or missing details, (e.g. missing bushings, missing locator pins) or corrosion.
* If a tool is lost notify your buyer immediately.
* Avoid metal-to-metal contact that may damage tool during storage and movement except for the following tooling templates: T002, T003, T004, T005, T006, T007, T009, T033, T055, T061, T087, T090, T098, T102, T215, T300, and T376.
* Non-damaging metal-to-metal contact to tool (metal contact will not affect critical area of tool) is permissible but should be avoided whenever possible.
* Store tooling in their respective boxes or containers, when available.
* Stack tooling with protective material between tools to prevent damage when containers are not available.
* Examine tool for cleanliness, obvious damage and/or missing details.
* For damaged or missing components/details; notify your buyer. If it is a T Type tool return it to Sikorsky and a TDO will be written for a detail replacement (Tool repair/Repair). If a Z-type tool; original fabricator should be able to repair. If a change to form, fit or function then a delta first article needs to be performed.
* Examine tool for missing or damaged (unreadable) Bar Code Label.
* Tools shall not be stored outside subject to weather conditions. Supplier is responsible for the protection and integrity of all tools. Government owned tools cannot be stored outside with no exceptions.