ST Engineering

Request for Quotation (RFQ)

Turnkey Project for Robot Tending for Variable Vane Inspection

Date: 11 September 2026

ST Engineering Aerospace Engines (STEA) has provided this information on a confidential basis and expects it to be used for the sole purpose of submitting proposals to meet ST Engineering Aerospace Engines' needs and requirements as described herein.

THIS RFQ SHALL NOT BE PHOTOCOPIED, REPRODUCED OR DISTRIBUTED TO OTHERS AT ANY TIME WITHOUT THE PRIOR WRITTEN CONSENT OF ST ENGINEERING AEROSPACE ENGINES.

1. Purpose

This RFQ invites vendors to submit technical and commercial proposals for the design, supply, integration, installation, commissioning, and handover of a turnkey robot tending solution for automated variable vane inspection within the Airfoil Cell, including an open and accessible external communication protocol / interface for ST Engineering Aerospace Engines' future access, troubleshooting, maintenance, and system integration needs.

The proposed solution is intended to streamline the variable vane inspection workflow by automating part handling from a tray to the existing OGP SmartScope Flash CNC 300 system, initiating the required dimensional inspection program in Zone3 software, exporting the inspection results, and returning each inspected vane back to its original slot position in the same tray to maintain part traceability.

The project aims to enhance inspection productivity, repeatability, and traceability while reducing manual intervention during normal operation. The proposed system shall also provide reliable part handling, consistent orientation and alignment, automatic result generation, out-of-limit identification, re-run logic where required, and complete handover support through commissioning, acceptance testing, training, documentation, and warranty coverage of 2 years.

2. Scope

The scope covers the design, supply, integration, installation, commissioning, testing, training, documentation, warranty support, and final handover of a turnkey robot tending system for variable vane inspection within the Airfoil Cell.

The vendor shall provide the equipment, hardware, software, controls, interfaces, safety provisions, fixtures, and accessories required to achieve reliable automatic operation. This includes, but is not limited to, the robot, end effector, gripper, part alignment interface, open and accessible external communication protocol / interface, and integration with the existing OGP SmartScope Flash CNC 300 and Zone3 software.

The solution shall include commissioning support, Site Acceptance Testing (SAT) in accordance with Section 5, operator and maintenance training, technical documentation, maintenance instructions, external communication protocol / interface documentation, a recommended spare parts list, warranty support, and final system handover. ST Engineering Aerospace Engines will provide the existing OGP SmartScope Flash CNC 300 system and Zone3 software, one tray for variable vane inspection, the working table, variable vanes for program verification, and the dimensional inspection requirements and related process information required for project execution.

3. Installation Address and Existing Equipment

3.1. Installation Address

The robot tending system for variable vane inspection shall be installed at the following address:

ST Engineering Aerospace Engines Pte Ltd
501 Airport Road, Paya Lebar
Singapore 539931

3.2. Existing Equipment

The proposed system will be integrated with the existing OGP SmartScope Flash CNC 300 system. The approximate equipment dimensions are 90 cm × 90 cm × 154 cm, as shown in Figure 1.

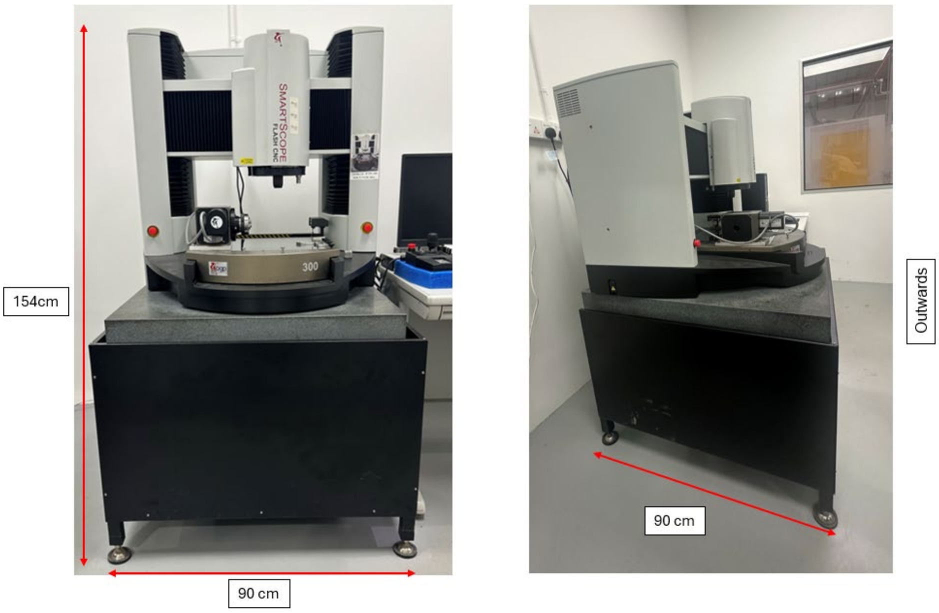


Figure 1: OGP SmartScope Flash CNC 300 system dimensions

3.3. Items Provided by ST Engineering Aerospace Engines

ST Engineering Aerospace Engines will provide the following items for the project:

3.3.1. The existing OGP SmartScope Flash CNC 300 system, including the Zone3 software
3.3.2. Communication protocol from the Zone3 software will be open for Q++ Programming
3.3.3. One tray (refer to Appendix A)
3.3.4. Working table (refer to Appendix B)
3.3.5. Variable vanes for program verification

3.3.6. The dimensional inspection requirements (refer to Appendices E to Q) and related process information

3.4. Software and Reporting Requirements

The system shall generate inspection reports by exporting the dimensional inspection results in Microsoft Excel-compatible or .csv format, as described in Section 4.6. The solution shall not require a Microsoft Office 365 subscription or cloud connection to operate.

The external communication protocol / interface shall be open, accessible, and fully documented to allow ST Engineering Aerospace Engines to access, review, configure, retrieve, and troubleshoot communication data without reliance on proprietary vendor restrictions. The vendor shall provide the applicable communication method, data structure, signal list, command list, error codes, configuration details, and access credentials where required.

3.5. Reference Workspace Layout

The current room layout is illustrated in Figure 2 for reference. Vendors may propose alternative layouts, provided the proposed arrangement meets the functional, safety, access, and operational requirements of this RFQ.

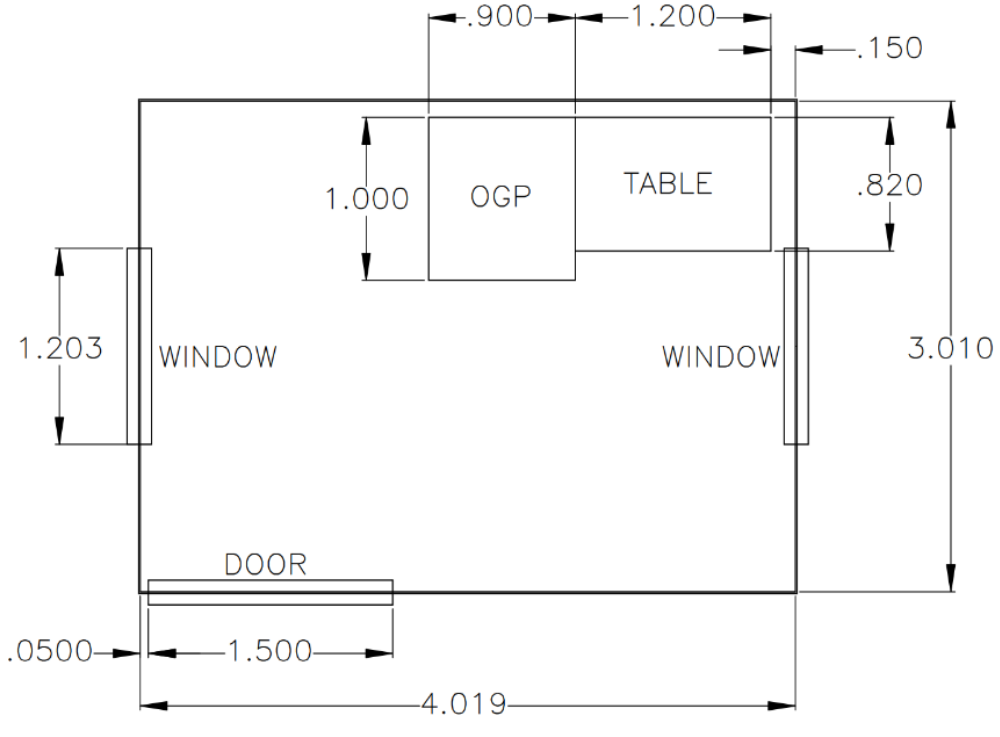


Figure 2: Plan view of the robot tending layout for variable vane inspection

4. Operating Methodology

4.1. Tray Preparation and Pick-Up

A single tray shall be used for each inspection batch. The tray shall hold the variable vanes of a single stage awaiting inspection and shall also serve as the return location after inspection. The robot shall return each inspected vane to the same original slot position in the same tray to maintain part traceability. Refer to Appendix A for the tray dimensions, Appendix C for the process flow chart of the operating methodology of this RFQ and Appendix D for the Data Communication Flow.

Variable vanes shall be arranged in the tray in sequential slot order, as illustrated in Figure 3. The longer stem of each variable vane shall face upwards to allow consistent robotic pick-up.

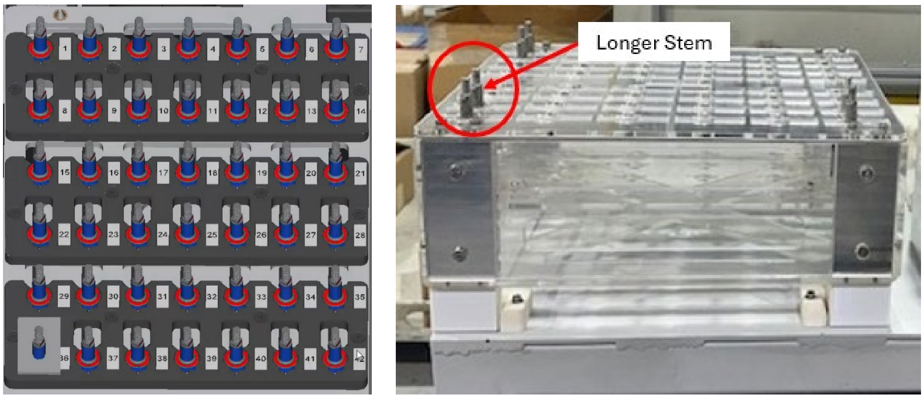


Figure 3: Variable vanes arranged in the tray

The tray shall be placed on the working table located near the robot. Prior to the start of each batch, the external communication interface determines the number of variable vanes present in the tray. It then transmits the stage, part number, original tray slot number, and required inspection program for each variable vane from the Raspberry Pi located at the Working Table to the OGP PC running Zone3. The robot shall pick each variable vane from its original tray slot, load it into the 3-jaw chuck of the machine for dimensional inspection, and upon completion, return it to the same original slot position in the same tray. The system shall maintain the relationship between each variable vane and its original slot throughout the inspection cycle to preserve part traceability. Refer to Appendix B for the working table dimensions.

The robot shall be capable of handling each variable vane, with an approximate part weight of 500 g.

4.2. System Setup and Program Selection

Following tray preparation and placement as described in Section 4.1, the system setup shall use the external communication interface to confirm the batch information before inspection begins. The interface shall communicate the variable vane stage, part number, original tray slot number, and required inspection program to the OGP PC with the Zone3 software. The original tray slot number shall be used to define the return position for each variable vane in the same tray, thereby maintaining slot-level traceability throughout the batch.

The vendor shall provide an open and accessible external communication protocol / interface that allows ST Engineering Aerospace Engines to access, review, configure, retrieve, and troubleshoot the required communication data used between the robot tending system, OGP SmartScope Flash CNC 300, and Zone3 software. The communication protocol shall not be locked, encrypted, or restricted by proprietary access controls that prevent STEA from performing future troubleshooting, maintenance, data retrieval, software configuration, or system integration activities. Complete interface documentation, including communication method, data structure, signal list, command list, handshake logic, error codes, configuration parameters, and access credentials where applicable, shall be provided as part of the final handover documentation.

Based on the communicated part and stage information, the system shall automatically select and load the appropriate inspection program in the Zone3 software before the robot starts picking variable vanes from the tray. This ensures that the inspection program selected for each batch corresponds to the vane stage and part information identified during system setup, while each inspected vane is returned to its original slot position in the same tray upon completion of inspection. The different variable vane stages for the CFM56-7B and LEAP 1A engines are shown in Figure 4.

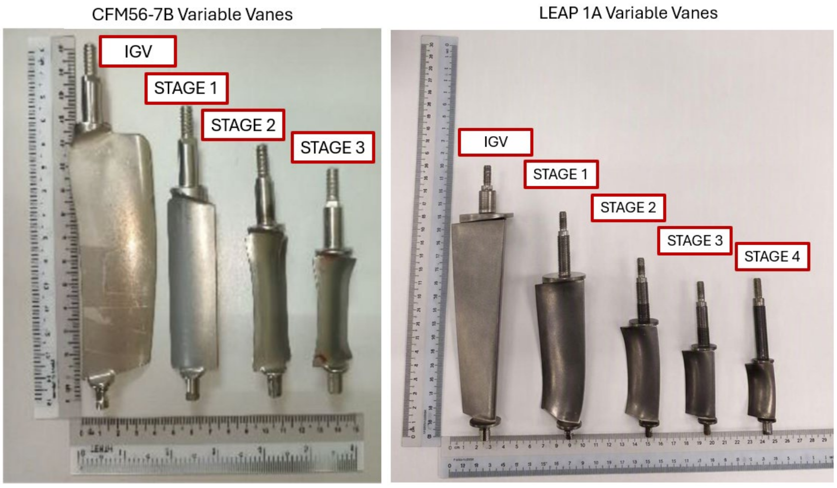


Figure 4: Different stages of variable vanes for CFM56-7B and LEAP 1A Engines

4.3. Robotic Handling and Loading

The robotic arm shall pick up each variable vane and load it securely into the 3-jaw chuck as shown in Figure 5. The vendor shall design the required interface to ensure the part is held securely and aligned correctly during loading and inspection.

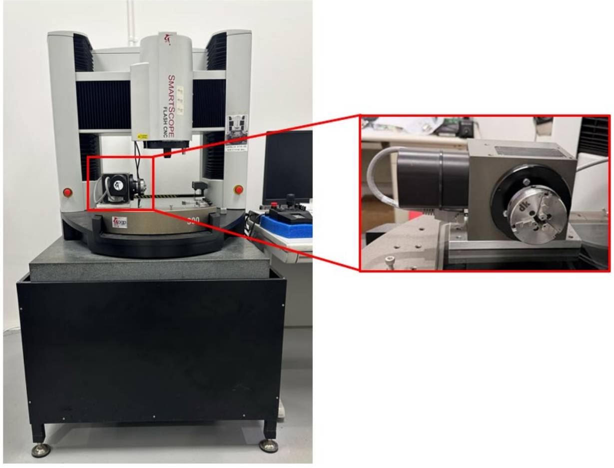


Figure 5: 3-jaw chuck

4.4. Part Alignment Requirements

The variable vane shall be positioned consistently in the chuck. The flat portion of the slot shall be oriented upwards, and the curved portion shall face outwards, as indicated in Figure 6.

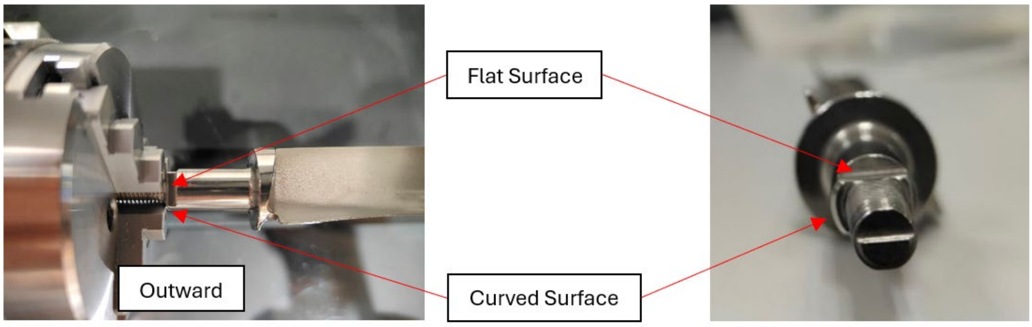


Figure 6: Plan view and side view of the variable vane in the 3-jaw chuck

4.5. Inspection Program Execution

4.5.1. Part Grip and Start Point Alignment

The robot shall pick up each variable vane from its original slot in the tray by its longer stem.

The robot shall place the vane onto an intermediary interface to reposition its grip to the cylindrical side before loading it into the chuck as illustrated in Figure 7. Vendor may propose an alternative method to this as long as it meets the requirements of this RFQ.

Figure 7: Proposed robotic gripping location

The robot shall insert the variable vane into the 3-jaw chuck interface such that the bottom left edge of the flat surface aligns with the inspection program start point, as shown in Figure 8.

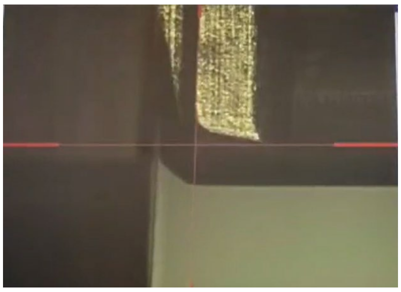


Figure 8: Start point of the Inspection Program

4.5.2. Automatic Program Start

Once the variable vane is securely gripped and correctly positioned in the 3-jaw chuck, the robot shall send a start signal to the OGP PC to trigger the corresponding inspection program in Zone3. The inspection program shall be initiated automatically through the open external communication protocol / interface or the machine / software control interface, without operator intervention. Manual initiation of the program, such as pressing “Enter” on the controller, shall be permitted only during manual or fallback operation.

4.5.3 Alignment Exception Handling

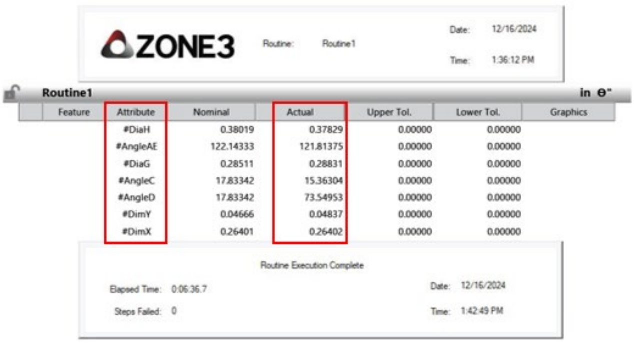
If the program fails to focus during the alignment step, the system shall stop safely, provide clear alarms or prompts, and allow operator intervention before the process is resumed.

The technician shall verify the part position and adjust the alignment as required before restarting or resuming the inspection process.

4.6. Results Generation and Export

4.6.1. Report Display and Export

Upon completion of each inspection run, the software shall display the dimensional results as shown in Figure 9 and automatically export the inspection report to Microsoft Excel-compatible or .csv format.



ZONE3 Routine: Routine1 Date: 12/16/2024 Time: 1:36:12 PM

Routine1 in Θ"

Feature	Attribute	Nominal	Actual	Upper Tol.	Lower Tol.	Graphics
	#DiaH	0.38019	0.37829	0.00000	0.00000	
	#AngleAE	122.14333	121.81375	0.00000	0.00000	
	#DiaG	0.28511	0.28831	0.00000	0.00000	
	#AngleC	17.83342	15.36304	0.00000	0.00000	
	#AngleD	17.83342	73.54953	0.00000	0.00000	
	#DimY	0.04666	0.04837	0.00000	0.00000	
	#DimX	0.26401	0.26402	0.00000	0.00000	

Routine Execution Complete

Elapsed Time: 0:06:36.7 Date: 12/16/2024

Steps Failed: 0 Time: 1:42:49 PM

Figure 9: Sample report generated in Zone3

4.6.2. Result Comparison Against Dimensional Inspection Limits

The software shall compare each measured dimensional result against the applicable inspection limits and present the comparison clearly for review as depicted in Figure 10.

CFM56-7B 72-32-02 STAGE 1 R003					
Dimensions	**Actual Measurements (")**	**Min. Finish Dimensions**		**Max. Finish Dimensions**	
Dim. Y		0.040	"	-	
Angle AE (P241P02)		93	°	-	
Dim. T1		0.149	"	-	
Angle C		2	°	12	°
Angle D		79	°	89	°
Dia. G		0.295	"	0.297	"

Figure 10: Sample report generated in an Excel compatible format

Any result falling outside the specified limits shall be automatically highlighted in red in the exported report. Results within the specified limits shall remain unhighlighted.

Refer to Appendices E to Q for the dimensional inspection requirements of the respective CFM56-7B and LEAP 1A variable vane stages.

4.6.3 Out-of-Limit Handling

If the first inspection run produces an out-of-limit result, the robot shall unload and reload the variable vane before repeating the dimensional inspection program.

If the dimensional result remains out of limits after the second inspection run, the variable vane shall be returned to its original slot position in the same tray and flagged for operator review or disposition in accordance with ST Engineering Aerospace Engines' internal process.

4.7. Completion of Cycle and Next Part Processing

4.7.1 Part Return and Replacement

After inspection and result export, the OGP PC sends a completion signal to the robot. The robotic arm shall unload the variable vane from the 3-jaw chuck and return it to its original slot position in the same tray.

The robot shall then pick the next variable vane in sequence from the same tray and load it into the chuck for the next inspection cycle.

4.7.2 Automatic Continuation

The system shall automatically initiate the next inspection cycle once the previous variable vane has been measured, reported, and returned to the corresponding slot in the tray. The cycle shall repeat until all variable vanes in the tray have been inspected. Once all the variable vanes have been inspected, the robot will send a signal to the raspberry pi on the working table that all vanes have been inspected and to proceed with the next tray.

5. Technical and Site Acceptance Test Requirement

5.1. Technical Acceptance Test Requirements

5.1.1. The robot shall be capable of safely handling each variable vane without part damage. The system shall consistently load the variable vane into the 3-jaw chuck in the required orientation and alignment.

5.1.2. The system shall automatically select and initiate the correct inspection program based on stage information.

5.1.3. The inspection report shall be exported in Microsoft Excel-compatible or .csv format and shall clearly identify out-of-limit results.

5.1.4. The system shall support re-run logic for out-of-limit readings where required.

5.1.5. The system shall include appropriate safety provisions, emergency stop functions, alarms, and manual / fallback operation.

5.1.6. The vendor shall demonstrate that the external communication protocol / interface is open, accessible, and not restricted by proprietary controls that prevent STEA from accessing, configuring, retrieving, or troubleshooting communication data.

5.1.7. Compliance with all technical requirements listed above shall be demonstrated during the Site Acceptance Test prior to final acceptance.

5.2. Site Acceptance Test Requirements

5.2.1. Robot pick-and-place operation from the original tray slot to the 3-jaw chuck and return to the same original slot position in the same tray.

5.2.2. Part orientation and alignment repeatability.

5.2.3. Automatic inspection program selection and initiation.

5.2.4. Result generation, export, and out-of-limit highlighting.

5.2.5. Out-of-limit re-run logic and part return sequence, including verification that each variable vane is returned to its original slot position in the same tray.

5.2.6. Alarm, emergency stop, manual / fallback mode, and recovery procedure verification.

5.2.7. Operator and maintenance training completion.

5.2.8. Verification that the external communication protocol / interface is open and accessible to STEA, including validation of communication documentation, configuration access, data retrieval, command/signal list, error codes, and any required access credentials.

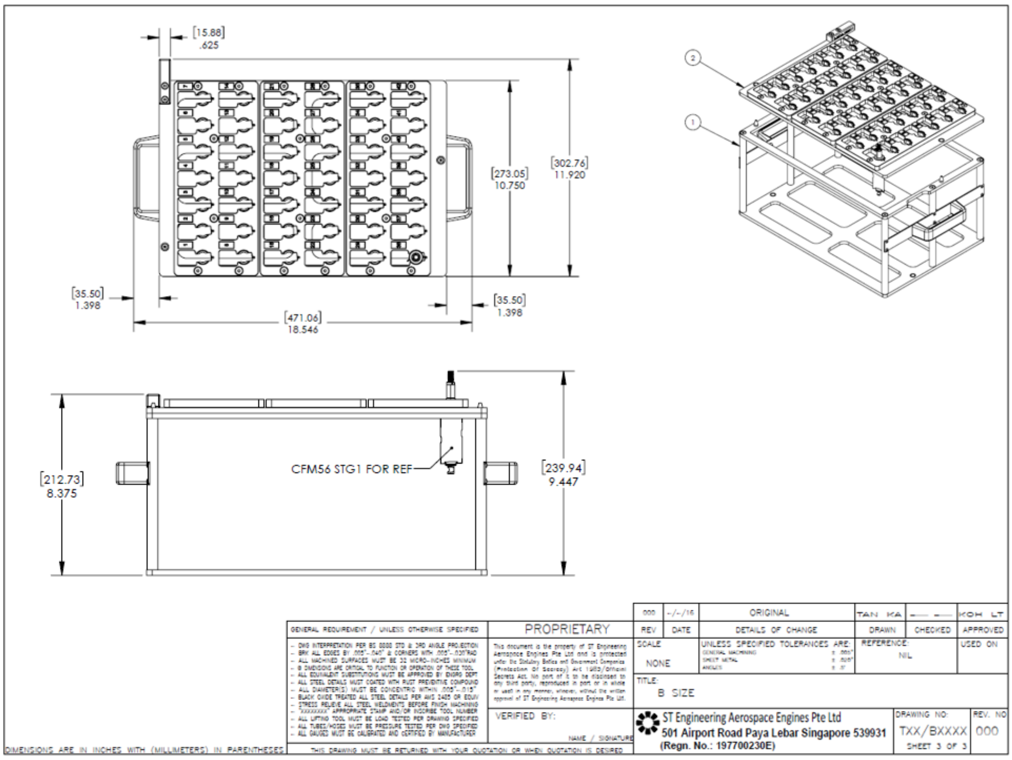
5.2.9. Documentation, maintenance instructions, spare parts list, and warranty information handover.

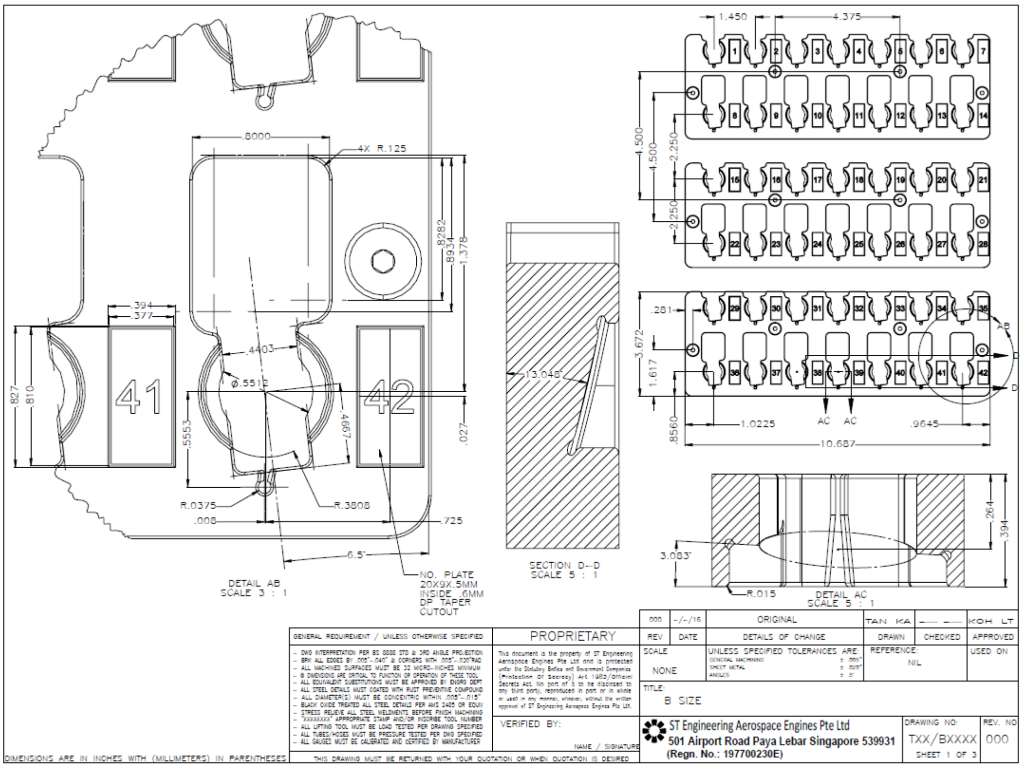
5.2.10. Successful completion and sign-off of all agreed SAT criteria before final acceptance.

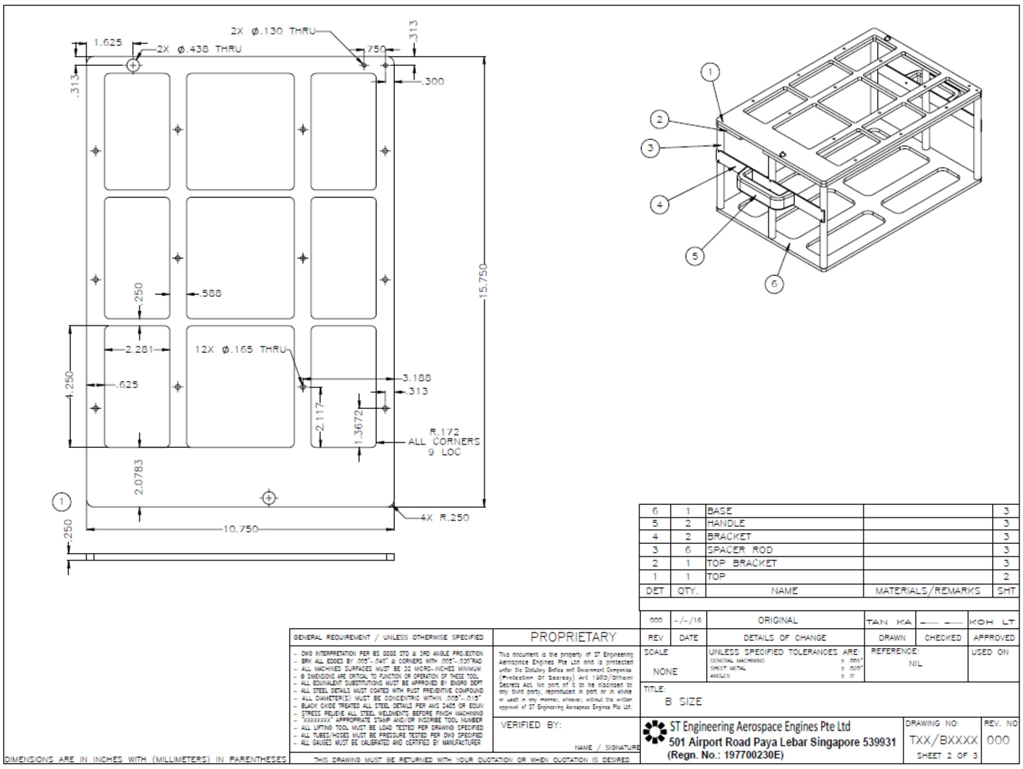
6. Appendices

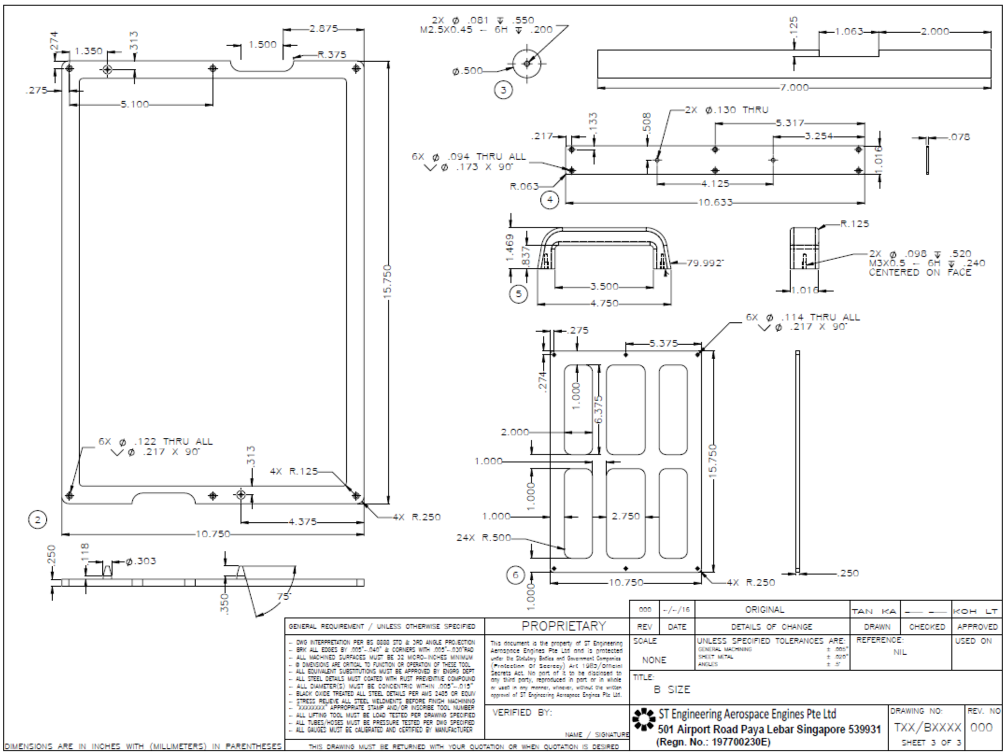
6.1 Equipment References and Process Flow Chart

Appendix A: Tray Dimensions

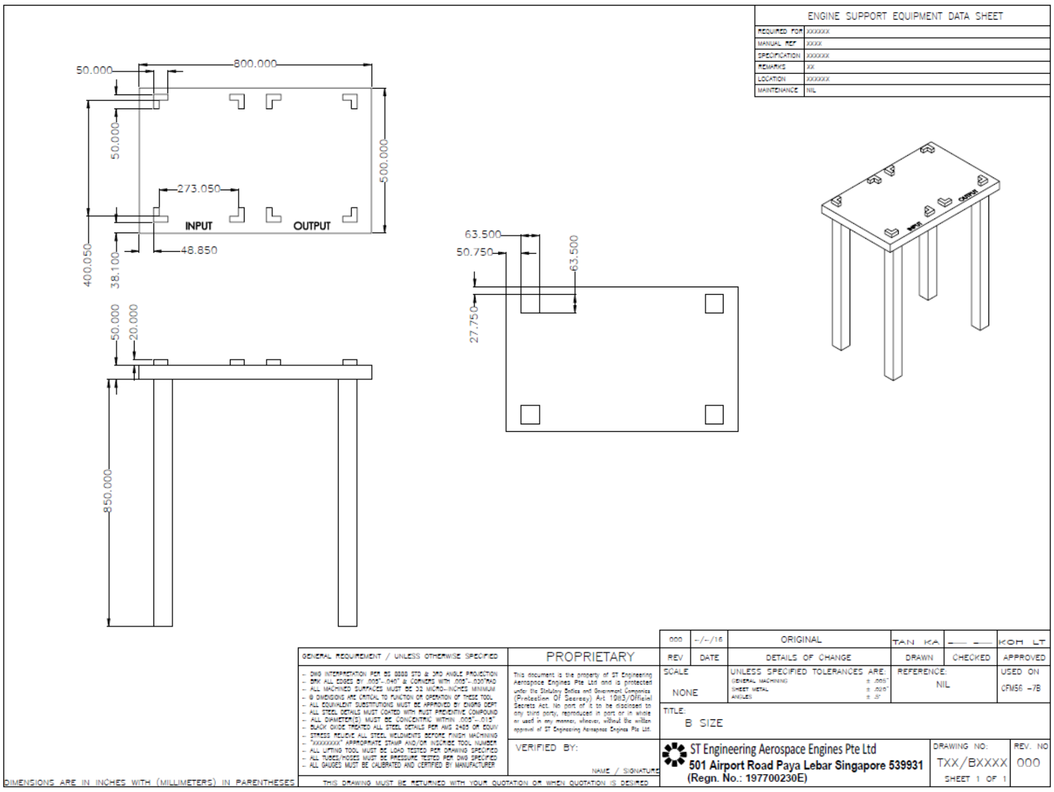




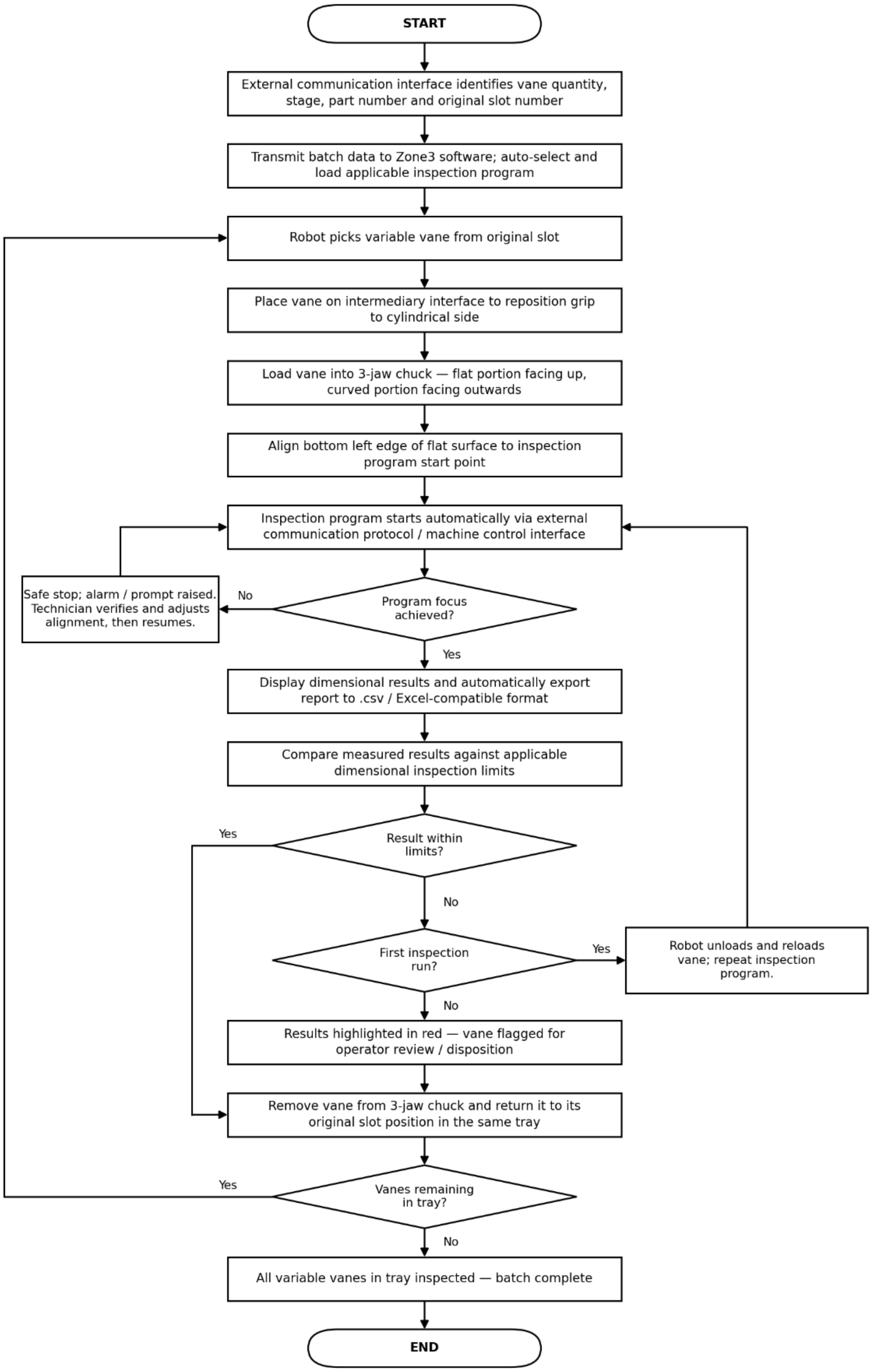

2X Ø.130 THRU
2X Ø.438 THRU
12X Ø.165 THRU
R.172 ALL CORNERS 9 LOC
4X R.250
15.750
10.750
6 | 1 | BASE | | 3
5 | 2 | HANDLE | | 3
4 | 2 | BRACKET | | 3
3 | 6 | SPACER ROD | | 3
2 | 1 | TOP BRACKET | | 3
1 | 1 | TOP | | 2
DET | QTY. | NAME | MATERIALS/REMARKS | SHT
000 | -/-/16 | ORIGINAL | TAN KA | KOH LT
REV | DATE | DETAILS OF CHANGE | DRAWN | CHECKED | APPROVED
GENERAL REQUIREMENT / UNLESS OTHERWISE SPECIFIED
PROPRIETARY
SCALE NONE
UNLESS SPECIFIED TOLERANCES ARE:
REFERENCE: NIL
USED ON
TITLE: B SIZE
VERIFIED BY:
ST Engineering Aerospace Engines Pte Ltd
501 Airport Road Paya Lebar Singapore 539931
(Regn. No.: 197700230E)
DRAWING NO: TXX/BXXXX
REV. NO 000
SHEET 2 OF 3
DIMENSIONS ARE IN INCHES WITH (MILLIMETERS) IN PARENTHESES
THIS DRAWING MUST BE RETURNED WITH YOUR QUOTATION OR WHEN QUOTATION IS DESIRED


2X Ø .081 ↧ .550
M2.5X0.45 – 6H ↧ .200
2X Ø.130 THRU
6X Ø .094 THRU ALL ⌵ Ø .173 X 90°
6X Ø .122 THRU ALL ⌵ Ø .217 X 90°
6X Ø .114 THRU ALL ⌵ Ø .217 X 90°
2X Ø .098 ↧ .520 M3X0.5 – 6H ↧ .240 CENTERED ON FACE
24X R.500
4X R.250
15.750
10.750
000 | -/-/16 | ORIGINAL | TAN KA | KOH LT
REV | DATE | DETAILS OF CHANGE | DRAWN | CHECKED | APPROVED
GENERAL REQUIREMENT / UNLESS OTHERWISE SPECIFIED
PROPRIETARY
SCALE NONE
UNLESS SPECIFIED TOLERANCES ARE:
REFERENCE NIL
USED ON
TITLE: B SIZE
VERIFIED BY:
ST Engineering Aerospace Engines Pte Ltd
501 Airport Road Paya Lebar Singapore 539931
(Regn. No.: 197700230E)
DRAWING NO: TXX/BXXXX
REV. NO 000
SHEET 3 OF 3
DIMENSIONS ARE IN INCHES WITH (MILLIMETERS) IN PARENTHESES
THIS DRAWING MUST BE RETURNED WITH YOUR QUOTATION OR WHEN QUOTATION IS DESIRED

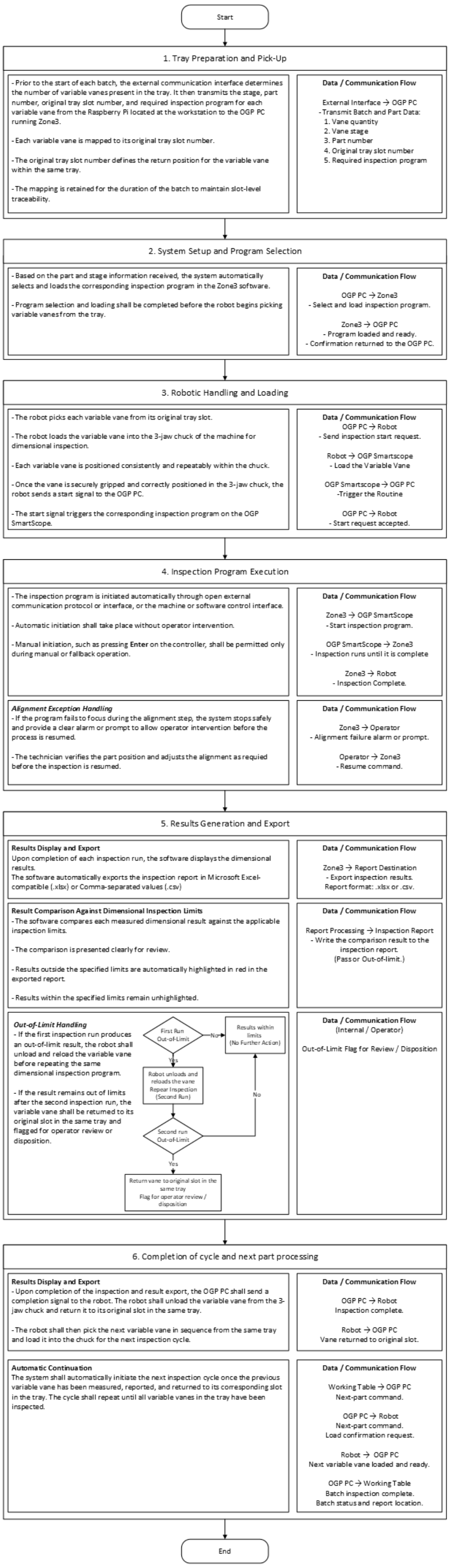
Appendix B: Working Table Dimensions



Appendix C: Process flow for the Robot Tending of the Variable Vane Inspection

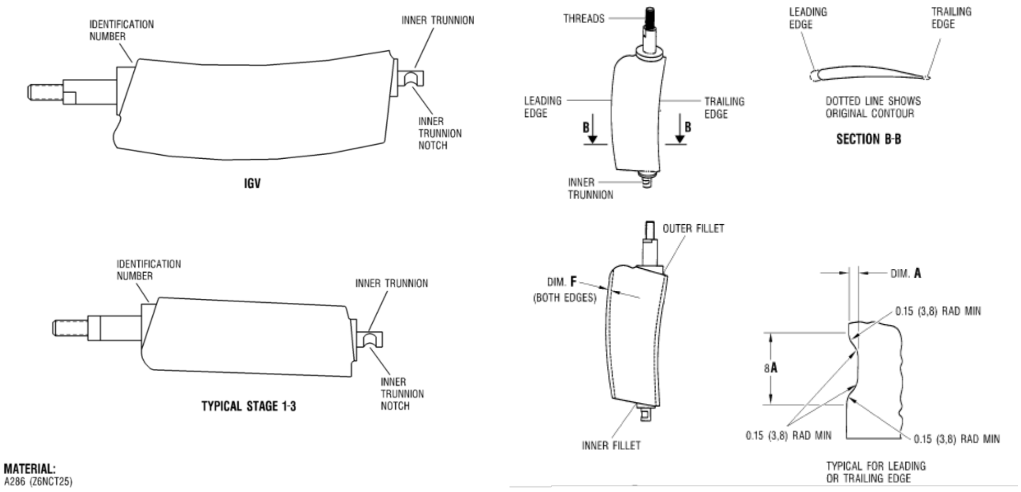


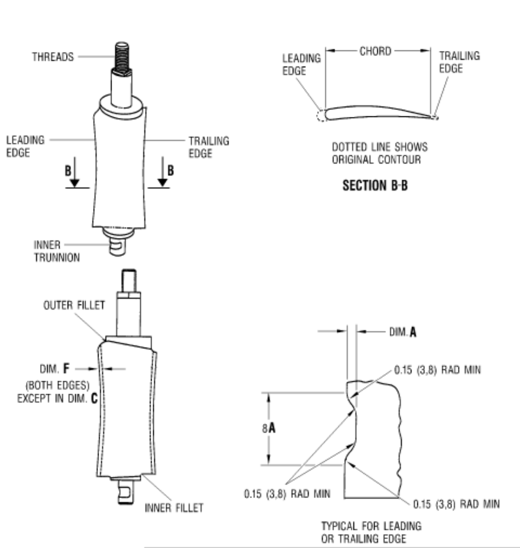
Appendix D: Data / Communication Process flow for the Robot Tending of the Variable Vane Inspection

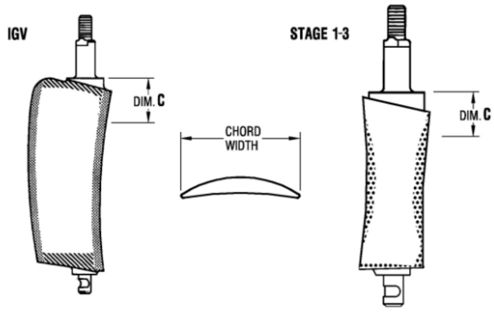


6.2 CFM56-7B Dimensional Inspection Requirements

Appendix E: CFM56-7B 72-32-02 R001 Dimensional Inspection Requirements

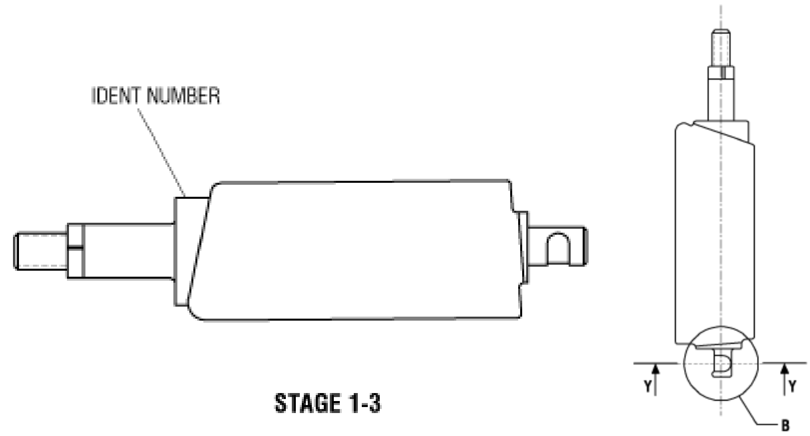




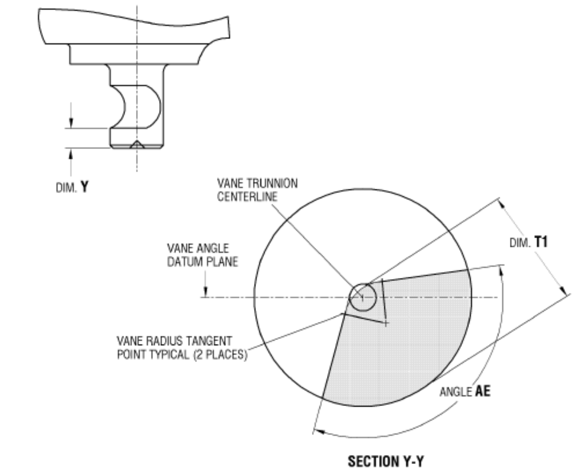


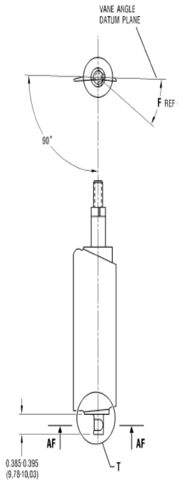
STAGE	PART NUMBER	DIMENSION C HEIGHT	MINIMUM CHORD WIDTH
IGV	P210	1.038 (26,37)	1.505 (38,23)
STAGE 1	P241	0.709 (18,01)	0.928 (23,57)
STAGE 2	P242 P262	0.465 (11,81)	0.862 (21,90)
STAGE 3	P243 P263	0.465 (11,81)	0.886 (22,50)

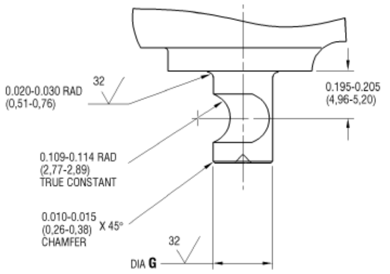
Appendix F: CFM56-7B 72-32-02 R003 Dimensional Inspection Requirements



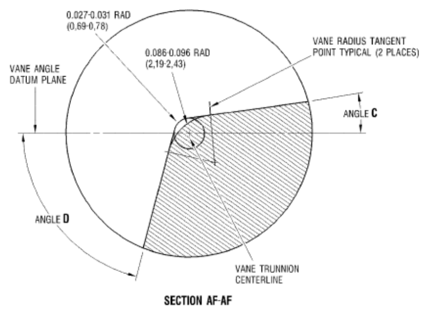
PART NUMBER	STAGE	DIM. **Y** (MIN)	ANGLE **AE** (MIN)	DIM. **T1** (MIN)
P241P02	1	0.040 (1,02)	93°	0.149 (3,79)
P242P02	2	0.040 (1,02)	98°	0.153 (3,89)
P242P04	2	0.040 (1,02)	98°	0.148 (3,76)
P243P02	3	0.040 (1,02)	102°	0.150 (3,81)





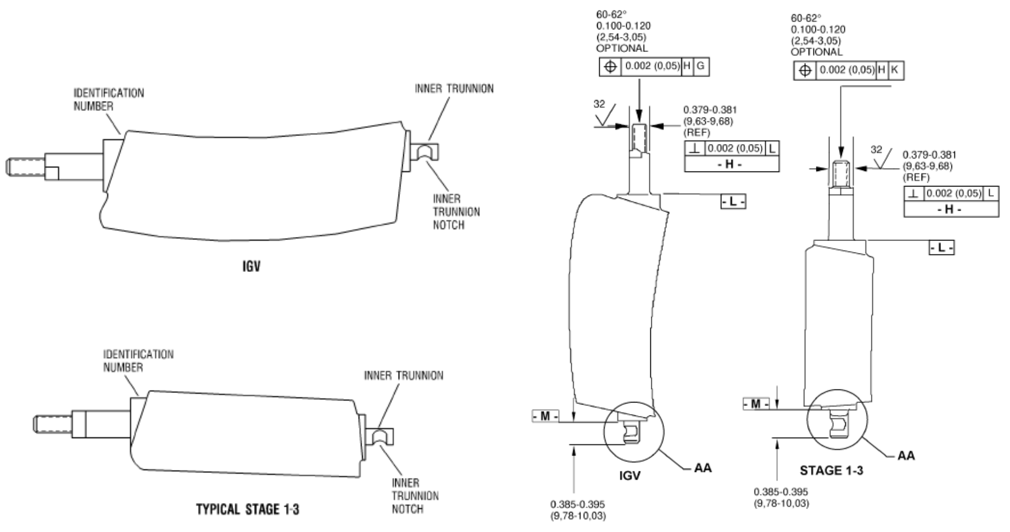


P/N	STAGE	ANGLE **F** ±0°15'	DIA **G** ±0.001
P241P02	1	43°10'	0.296 (7,52)
P242P02	2	41°10'	0.296 (7,52)
P242P04	2	41°10'	0.286 (7,26)
P243P02	3	40°8'	0.286 (7,26)

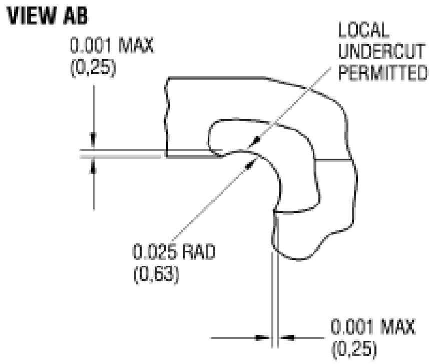


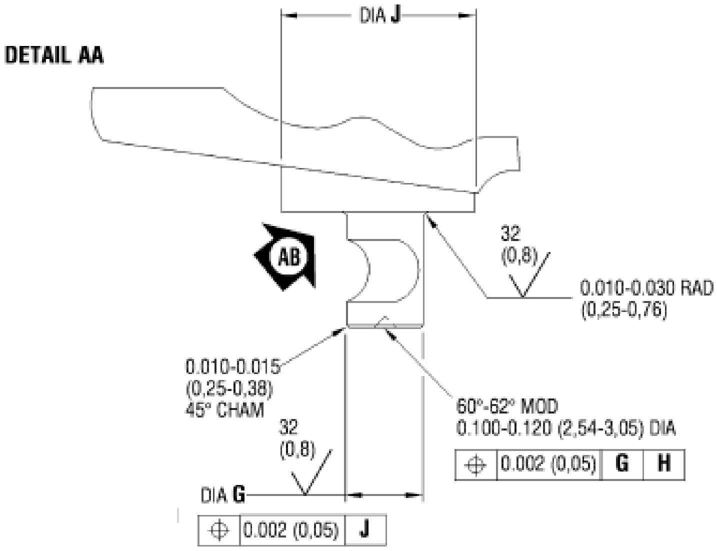
P/N	STAGE	ANGLE **C**° ±5 DEG	ANGLE **D**° ±5 DEG
P241	1	7°	84°
P242	2	7°	79°
P243	3	8°	76°

Appendix G: CFM56-7B 72-32-02 R004 Dimensional Inspection Requirements

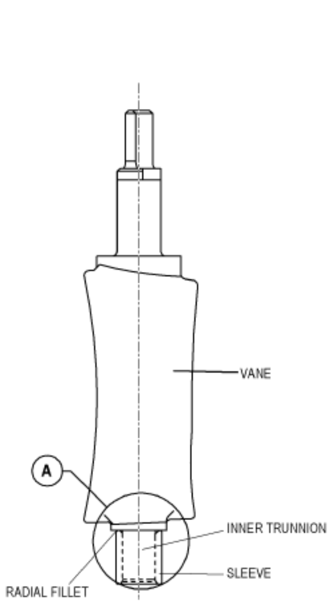


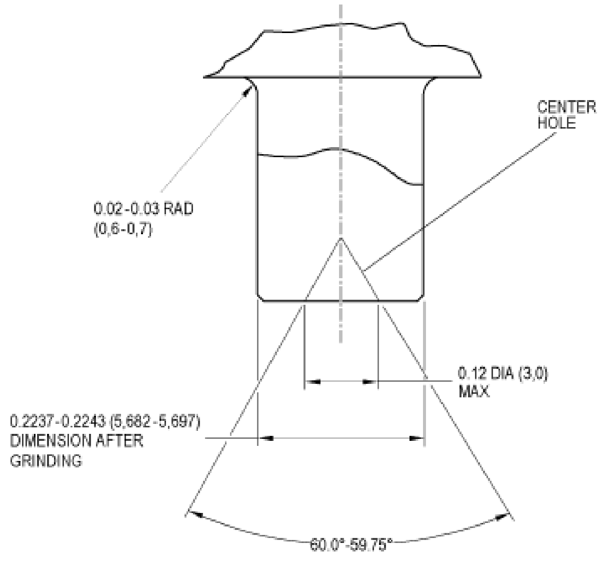
P/N	STAGE	DIA **G**
P210	IGV	0.250-0.252 (6,35-6,40)
P241	1	0.295-0.297 (7,49-7,54)
P242P01 P242P02	2	0.295-0.297 (7,49-7,54)
P242P04	2	0.285-0.287 (7,24-7,29)
P243	3	0.285-0.287 (7,24-7,29)



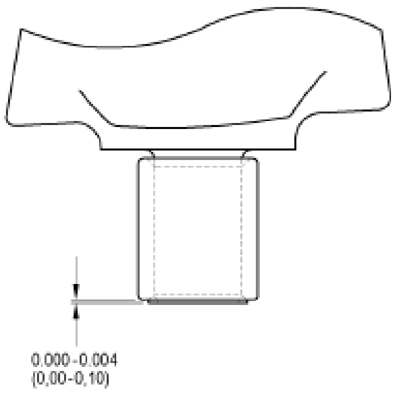


Appendix H: CFM56-7B 72-32-02 R008 Dimensional Inspection Requirements





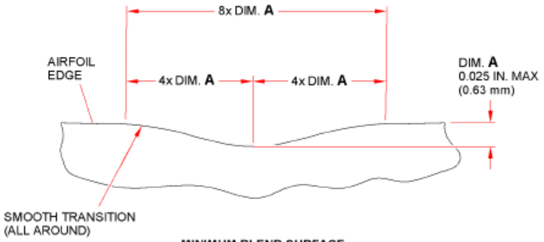
A



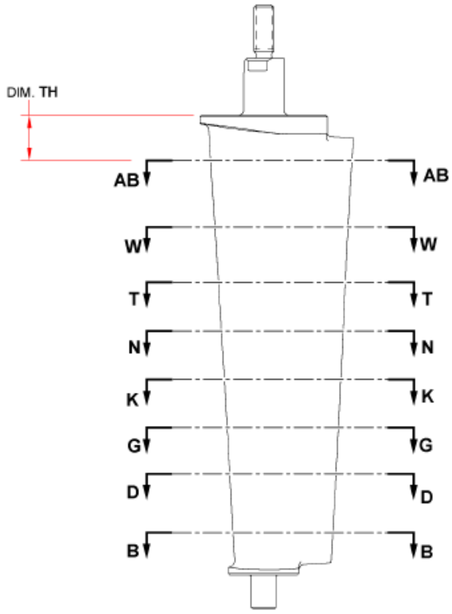
A

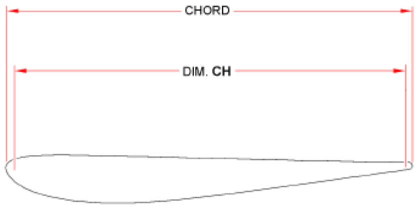
6.3 LEAP 1A Dimensional Inspection Requirements

Appendix I: LEAP 1A IGV 72-24-24 R001 Dimensional Inspection Requirements

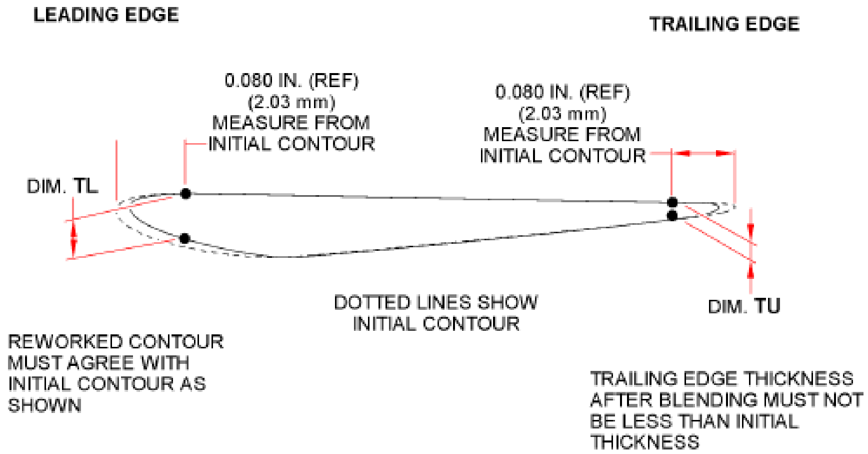


MINIMUM BLEND SURFACE



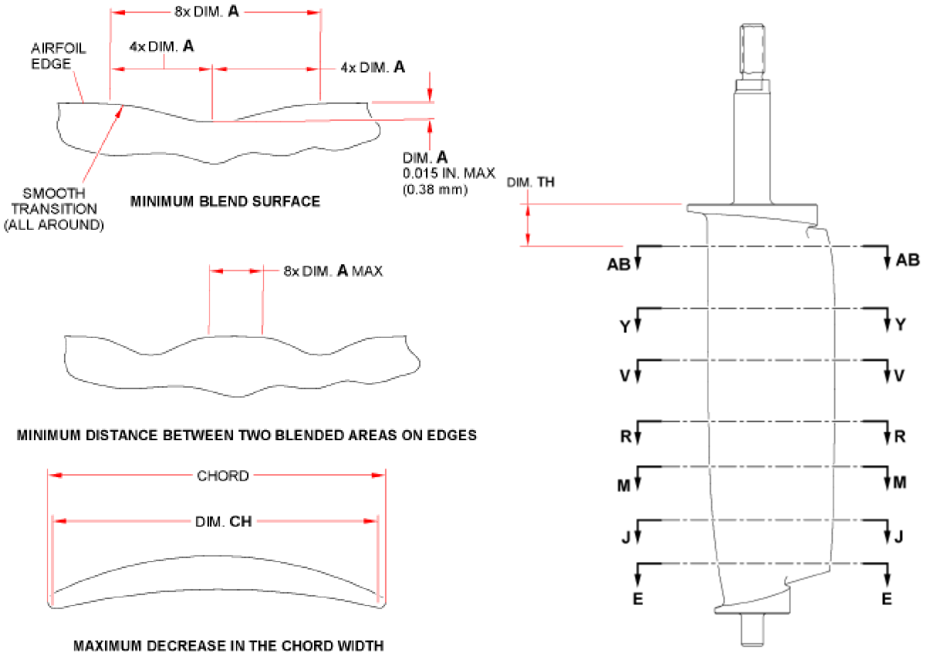


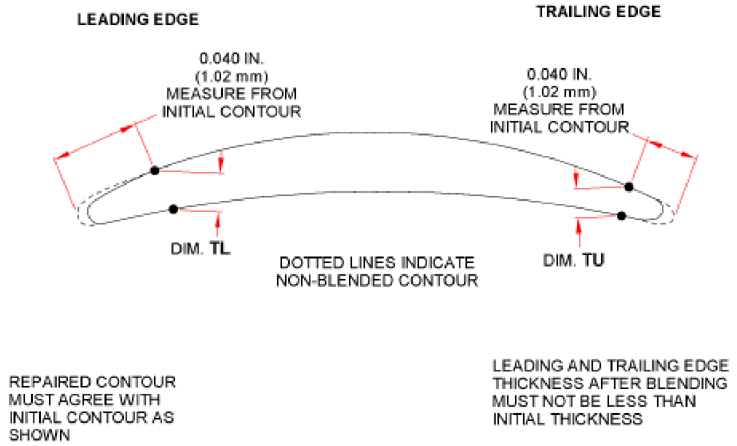
MAXIMUM DECREASE IN THE CHORD WIDTH



SECTION	DIM. TH	DIM. CH (CHORD WIDTH, MINIMUM CHORD AFTER REPAIR)	DIM. TL (MINIMUM LEADING EDGE THICKNESS AFTER REPAIR)	DIM. TU (MINIMUM TRAILING EDGE THICKNESS AFTER REPAIR)
B-B	5.637 IN. (143.18 mm)	1.213 IN. (30.82 mm)	0.110 IN. (2.80 mm)	0.032 IN. (0.82 mm)
D-D	5.157 IN. (130.99 mm)	1.270 IN. (32.26 mm)	0.110 IN. (2.80 mm)	0.032 IN. (0.82 mm)
G-G	4.387 IN. (111.43 mm)	1.362 IN. (34.60 mm)	0.110 IN. (2.80 mm)	0.032 IN. (0.82 mm)
K-K	3.627 IN. (92.13 mm)	1.451 IN. (36.86 mm)	0.110 IN. (2.80 mm)	0.032 IN. (0.82 mm)
N-N	2.717 IN. (69.01 mm)	1.560 IN. (39.63 mm)	0.119 IN. (3.03 mm)	0.033 IN. (0.84 mm)
T-T	1.887 IN. (47.93 mm)	1.660 IN. (42.17 mm)	0.121 IN. (3.08 mm)	0.035 IN. (0.89 mm)
W-W	1.117 IN. (28.37 mm)	1.751 IN. (44.48 mm)	0.119 IN. (3.03 mm)	0.039 IN. (1.00 mm)
AB-AB	0.427 IN. (10.85 mm)	1.833 IN. (46.56 mm)	0.115 IN. (2.93 mm)	(0.062 IN. (1.58 mm)

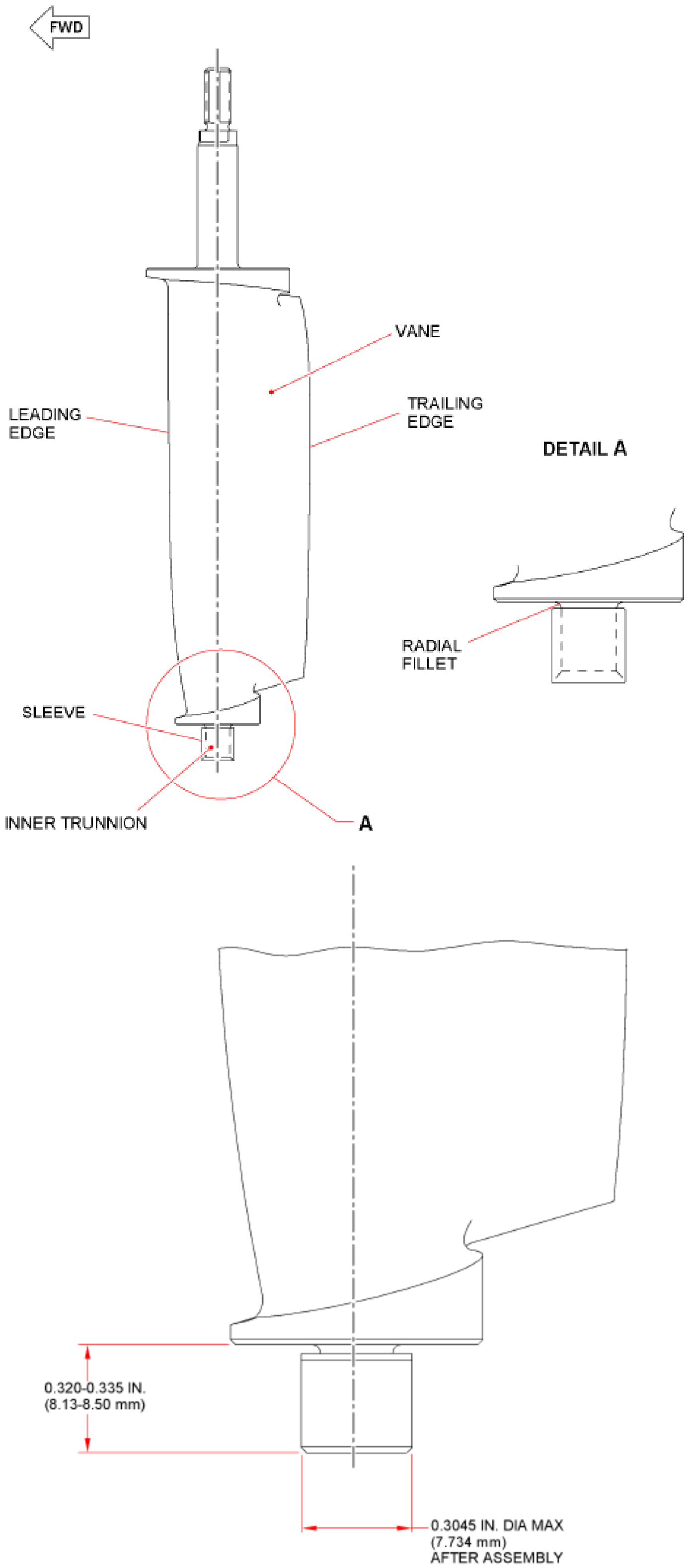
Appendix J: LEAP 1A Stage 1 72-32-20 R001 Dimensional Inspection Requirements



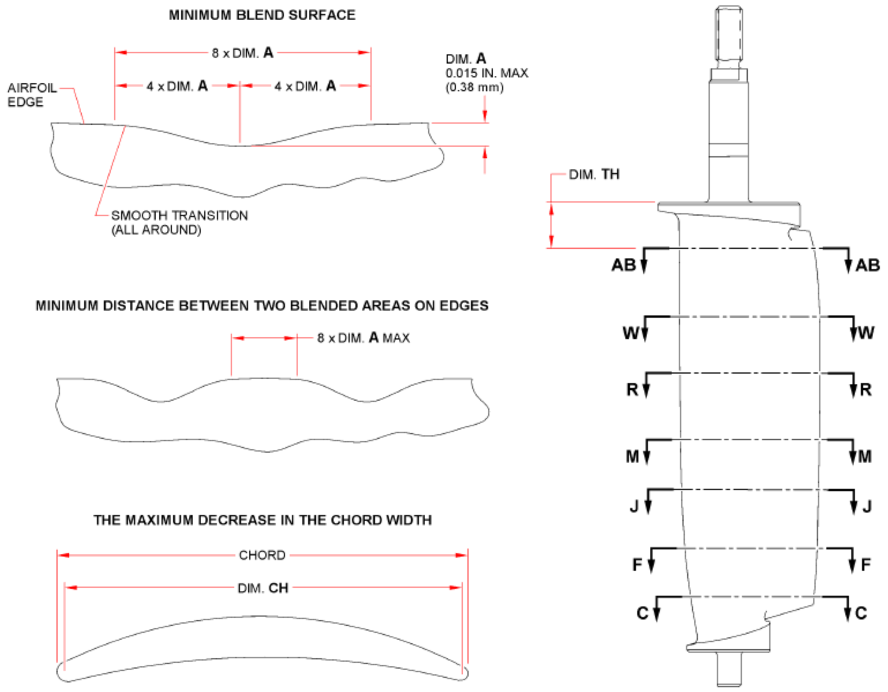


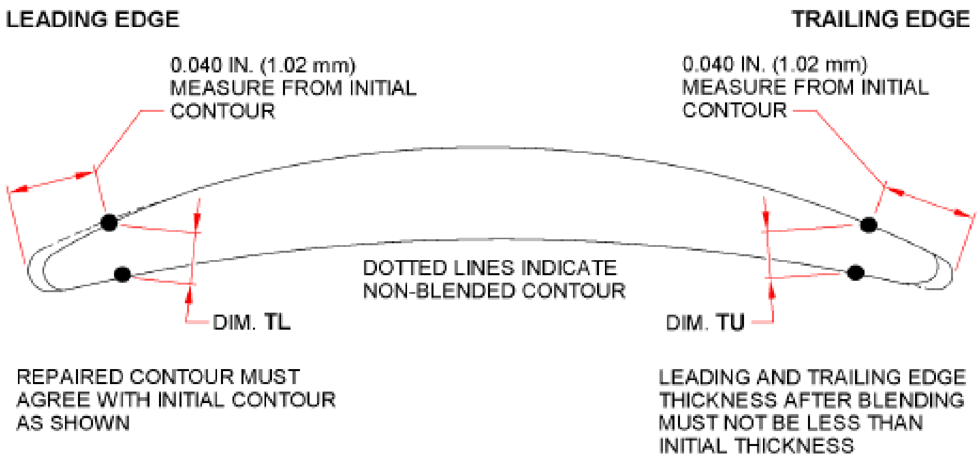
SECTION	DIM. TH	DIM. CH (CHORD WIDTH, MINIMUM CHORD AFTER REPAIR)	DIM. TL (MINIMUM LEADING EDGE THICKNESS AFTER REPAIR)	DIM. TU (MINIMUM TRAILING EDGE THICKNESS AFTER REPAIR)
EE	3.648 IN. (92.66 mm)	1.289 IN. (32.75 mm)	0.022 IN. (0.56 mm)	0.019 IN. (0.49 mm)
JJ	3.098 IN. (78.69 mm)	1.349 IN. (34.27 mm)	0.024 IN. (0.61 mm)	0.015 IN. (0.39 mm)
MM	2.438 IN. (61.93 mm)	1.404 IN. (35.67 mm)	0.027 IN. (0.69 mm)	0.014 IN. (0.36 mm)
RR	1.778 IN. (45.16 mm)	1.445 IN. (36.71 mm)	0.032 IN. (0.82 mm)	0.015 IN. (0.39 mm)
VV	1.108 IN. (28.14 mm)	1.483 IN. (37.67 mm)	0.038 IN. (0.97 mm)	0.015 IN. (0.39 mm)
YY	0.728 IN. (18.49 mm)	1.493 IN. (37.93 mm)	0.041 IN. (1.05 mm)	0.016 IN. (0.41 mm)
ABAB	0.448 IN. (11.38 mm)	1.491 IN. (37.88 mm)	0.042 IN. (1.07 mm)	0.016 IN. (0.41 mm)

Appendix K: LEAP 1A Stage 1 72-32-20 R002 Dimensional Inspection Requirements



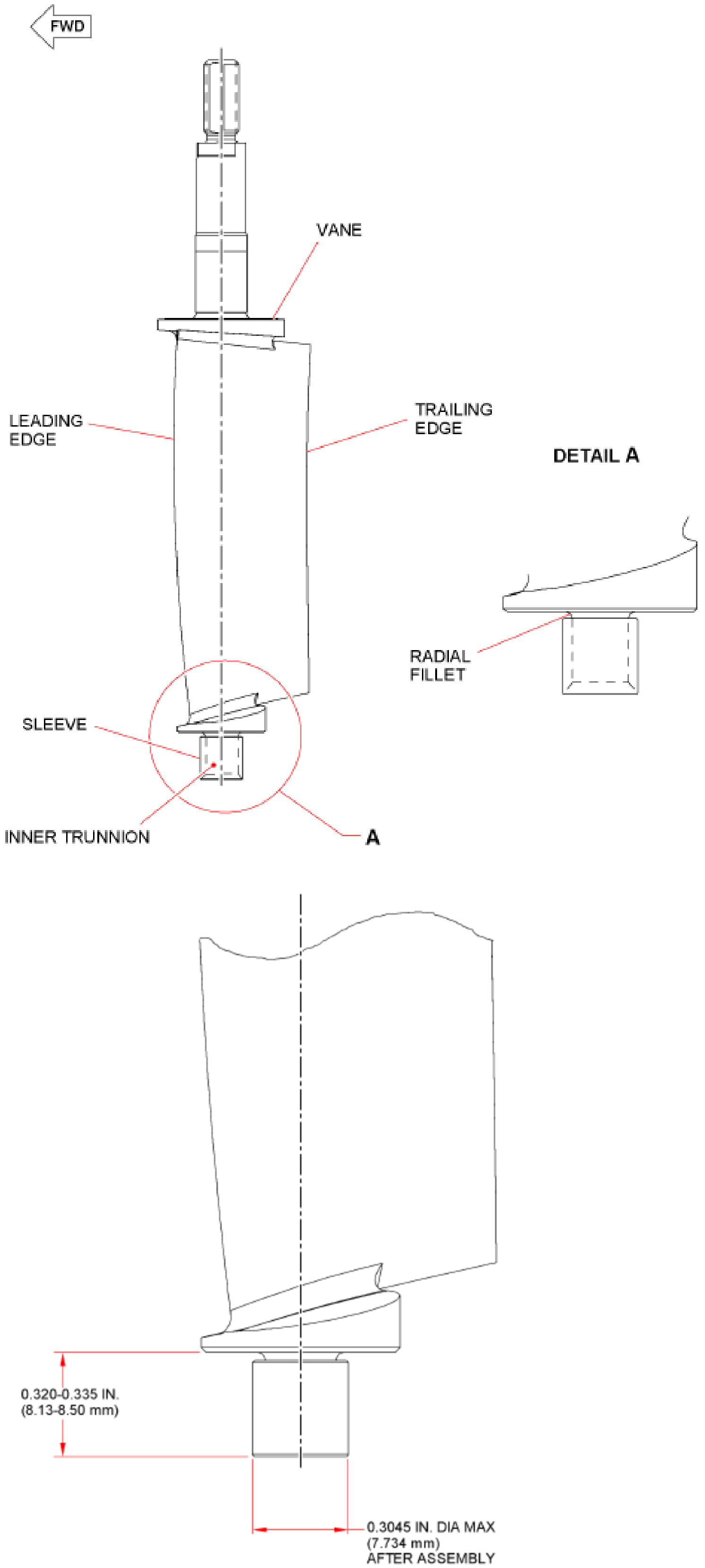
Appendix L: LEAP 1A Stage 2 72-32-21 R001 Dimensional Inspection Requirements



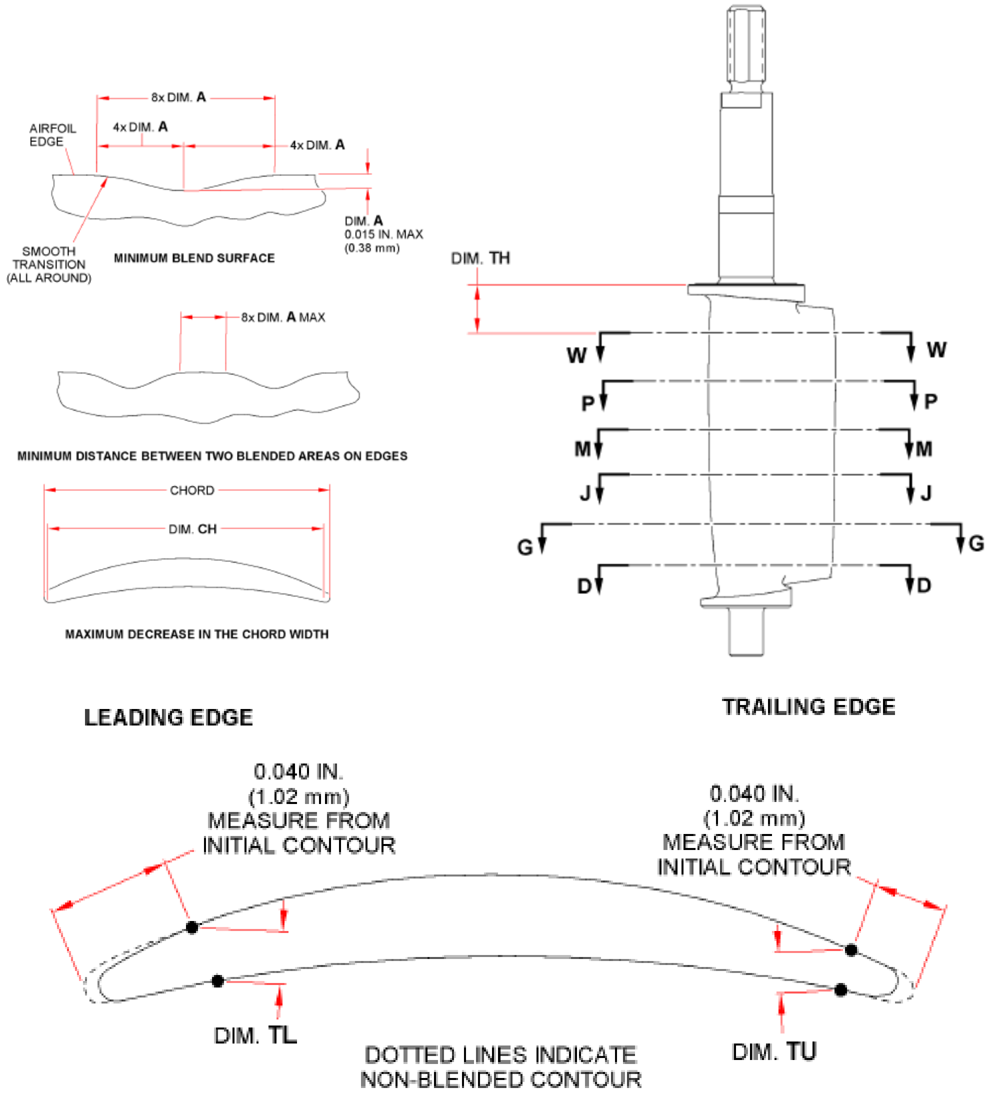


SECTION	DIM. **TH**	DIM. **CH** (CHORD WIDTH, MINIMUM CHORD AFTER REPAIR)	DIM. **TL** (MINIMUM LEADING EDGE THICKNESS AFTER REPAIR)	DIM. **TU** (MINIMUM TRAILING EDGE THICKNESS AFTER REPAIR)
CC	2.580 IN. (65.53 mm)	1.001 IN. (25.43 mm)	0.017 IN. (0.44 mm)	0.011 IN. (0.28 mm)
FF	2.250 IN. (57.15 mm)	0.977 IN. (24.82 mm)	0.020 IN. (0.51 mm)	0.010 IN. (0.26 mm)
JJ	1.920 IN. (48.77 mm)	0.984 IN. (25.00 mm)	0.023 IN. (0.59 mm)	0.011 IN. (0.28 mm)
MM	1.540 IN. (39.12 mm)	0.997 IN. (25.33 mm)	0.025 IN. (0.64 mm)	0.012 IN. (0.31 mm)
RR	1.040 IN. (26.42 mm)	1.015 IN. (25.79 mm)	0.027 IN. (0.69 mm)	0.012 IN. (0.31 mm)
WW	0.600 IN. (15.24 mm)	1.046 IN. (26.57 mm)	0.027 IN. (0.69 mm)	0.014 IN. (0.36 mm)
ABAB	0.270 IN. (6.86 mm)	1.112 IN. (28.25 mm)	0.027 IN. (0.69 mm)	0.018 IN. (0.46 mm)

Appendix M: LEAP 1A Stage 2 72-32-21 R002 Dimensional Inspection Requirements



Appendix N: LEAP 1A Stage 3 72-32-22 R001 Dimensional Inspection Requirements

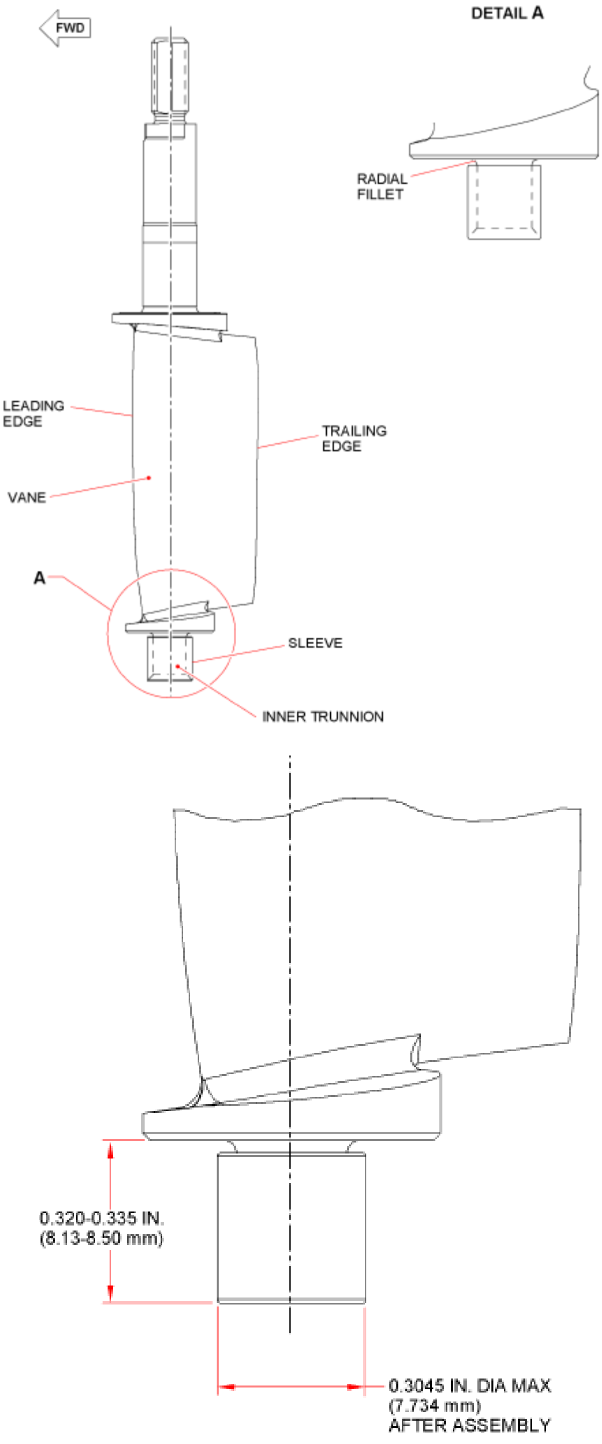


REPAIRED CONTOUR MUST AGREE WITH INITIAL CONTOUR AS SHOWN

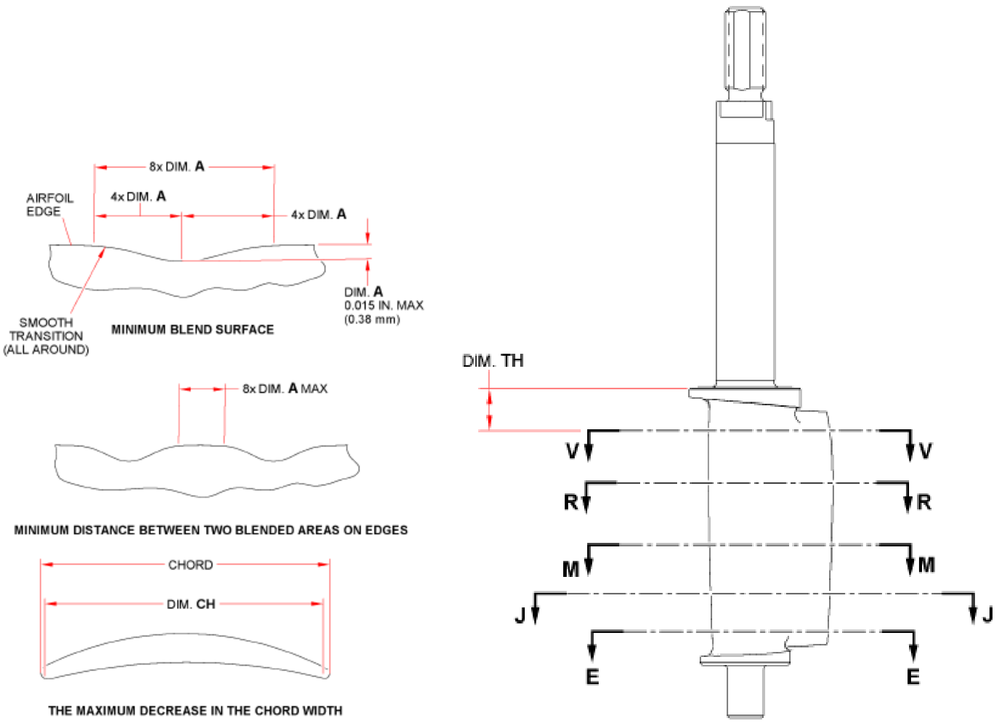
LEADING AND TRAILING EDGE THICKNESS AFTER BLENDING MUST NOT BE LESS THAN INITIAL THICKNESS

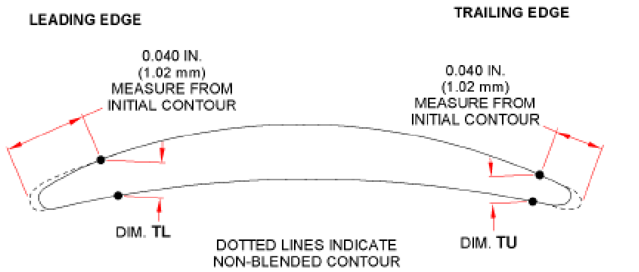
SECTION	DIM. TH	DIM. CH (CHORD WIDTH, MINIMUM CHORD AFTER REPAIR)	DIM. TL (MINIMUM LEADING EDGE THICKNESS AFTER REPAIR)	DIM. TU (MINIMUM TRAILING EDGE THICKNESS AFTER REPAIR)
DD	1.869 IN. (47.47 mm)	0.874 IN. (22.20 mm)	0.023 IN. (0.59 mm)	0.010 IN. (0.26 mm)
GG	1.569 IN. (39.85 mm)	0.879 IN. (22.33 mm)	0.024 IN. (0.61 mm)	0.010 IN. (0.26 mm)
JJ	1.369 IN. (34.77 mm)	0.882 IN. (22.41 mm)	0.026 IN. (0.67 mm)	0.011 IN. (0.28 mm)
MM	1.069 IN. (27.15 mm)	0.889 IN. (22.59 mm)	0.028 IN. (0.72 mm)	0.011 IN. (0.28 mm)
PP	0.869 IN. (22.07 mm)	0.895 IN. (22.74 mm)	0.028 IN. (0.72 mm)	0.011 IN. (0.28 mm)
WW	0.369 IN. (9.37 mm)	0.926 IN. (23.53 mm)	0.028 IN. (0.72 mm)	0.011 IN. (0.28 mm)

Appendix O: LEAP 1A Stage 3 72-32-22 R002 Dimensional Inspection Requirements



Appendix P: LEAP 1A Stage 4 72-32-23 R001 Dimensional Inspection Requirements





REPAIRED CONTOUR MUST AGREE WITH INITIAL CONTOUR AS SHOWN

LEADING AND TRAILING EDGE THICKNESS AFTER BLENDING MUST NOT BE LESS THAN INITIAL THICKNESS

SECTION	DIM. **TH**	DIM. **CH** (CHORD WIDTH, MINIMUM CHORD AFTER REPAIR)	DIM. **TL** (MINIMUM LEADING EDGE THICKNESS AFTER REPAIR)	DIM. **TU** (MINIMUM TRAILING EDGE THICKNESS AFTER REPAIR)
EE	1.469 IN. (37.31 mm)	0.778 IN. (19.77 mm)	0.018 IN. (0.46 mm)	0.011 IN. (0.28 mm)
JJ	1.069 IN. (27.15 mm)	0.778 IN. (19.77 mm)	0.022 IN. (0.56 mm)	0.009 IN. (0.23 mm)
MM	0.769 IN. (19.53 mm)	0.788 IN. (20.02 mm)	0.024 IN. (0.61 mm)	0.010 IN. (0.26 mm)
RR	0.469 IN. (11.91 mm)	0.804 IN. (20.43 mm)	0.026 IN. (0.67 mm)	0.010 IN. (0.26 mm)
VV	0.269 IN. (6.83 mm)	0.822 IN. (20.88 mm)	0.026 IN. (0.67 mm)	0.013 IN. (0.34 mm)

Appendix Q: LEAP 1A Stage 4 72-32-23 R002 Dimensional Inspection Requirements