

	ACCEPT	REJECT	COMMENTS
<p><b>1). PURPOSE</b> This Data Configuration Control Procedure governs receipt, usage and distribution of product definition datasets. It defines the determination and identification of authority and derivative datasets, and procedures to assure valid configuration control throughout all operations. This plan defines the required documentation of digital operations and the responsibilities of information technology personnel for control of them.</p> <p>2). SCOPE <b>This plan meets all Compucraft Customer requirements contained in the referenced documents and consists of the minimum data requirements for all CII suppliers. All Customers data requirements must be met.</b></p> <p>CII shall ensure compliance to the requirements of this document prior to the use of customer supplied datasets for the manufacture and inspection of deliverable hardware.</p> <p>To maintain authority status with our customer, CII agrees to keep current on all enhancements that are required for compatibility between companies. This would include but not limited to version levels (maintenance, fixes, etc.) per D6-56199 and Northrop Grumman SQAR.</p> <p><b>3). DEFINITIONS</b></p>			

**AUTHORITY DATASETS – a Dataset, which provides the undisputed source for product acceptance to, approved type designs. It is under configuration management with access, release and change controls in place to ensure definition integrity.**

**CAD/CAM** Computer Aided Design/Computer Aided Manufacturing. A computer system that supports a program from the design concept to the manufacture and inspection of the finished part or product.

**DERIVATIVE –** A reproduction of all or part of an authority dataset. Derivatives include paper and mylar plots, tool designs, inspection datasets created to analyze as-built designs, check templates, numerical control, (N/C) datasets/media, datasets with nominal values for CMS use, QA inspection plans and other extractions (dimensions, views, etc..) for inspection/measurement use.

**Digital Product Definition (DPD –** The electronic data elements that specify the geometry and all design requirements for a product, (including notation and parts lists), and the use of this data throughout an integrated system using computer aided design, computer aided manufacturing and coordinate measurement systems. Also known as CAD/CAM systems.

**FEATURE –** Any hardware design attribute or characteristic. This includes physical portions of

hardware such as a surface, face, edge, radius, hole, tab, slot, pin etc.. and requirements such as Non-destructive Inspection, (NDI) and Interchangeability and Replaceability (I&R). All features require validation to conform the product to the design authority. All features have associated notes and/or Geometric Dimensioning and Tolerance Feature control frames. But one note of FCF may refer to several features.

**ENGINEERING REQUEST (ER)** A Letter or document, which asks for official clarification of incomplete, conflicting or non-conforming data, associated with a Customer Dataset.

**INSPECTION PLAN** A description of 2D and/or 3D computer generated inspection media/methods, derived from authority DPD datasets used to communicate inspection requirements and media usage to manufacturing and inspection areas. Typical plans include engineering and plan configuration/traceability, overlay/setup instructions, and a list and/or graphic representation of the features to be inspected.

**Numerical Control (NC)** – Electronic media and process used to manufacture products. Also known as CAM computer aided manufacturing.

**IGES** Initial Graphics Exchange Specification. The American National Standards Institute (ANSI) Data standard for the exchange of computer graphics between CAD/CAM systems and allows for dissimilar

<p>computer systems to be exchanged.</p> <p>PAS Product Acceptance Software – DPD software, (including CAD, LEV, Data exchange and CMS systems), used to inspect and accept parts, assemblies, tooling and systems. Note: Not embedded or loadable airborne software.</p> <p>REPRODUCED CONTENT DATASET – Any DPD design dataset without full dimensioning of product features on a 2D sheet. This format may or may not include one or more 2D sheets. Model Based definition is one term used to describe a dataset without 2D sheets.</p> <p>MDD/MDI/MDS -Master Dimensions controlling the definition of a curve or surface.</p> <p>QAID Quality Assurance Inspection Data – Inspection data developed from and traceable to engineering datasets and certified as a media for product acceptance.</p> <p><b>CMS Coordinate Measurement System – Measurement and test equipment used to support CAI activities including but not limited to Coordinate Measuring machines (CMM).</b></p> <p><b>4). REFERENCES</b></p> <p>QA111 B.F. Goodrich Quality Requirements</p>			
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CP 1801	Human Resources Development & Training			
D6-51991	Boeing			
D6-56199	Boeing			
D6-81491	Boeing			
SQAR Rev. 9/16/03	Northrop Grumman			
5). CONFIGURATION MANAGEMENT				
5.1)	<b>Engineering Check department receives DPD datasets by various methods, e.g. FTP, CD, e-mail, magnetic tapes and hand delivered. Engineering Check administrator or designee load DPD datasets into a customer specific environment ensuring complete separation of customer data. The control and restrictions of customer data are as follows (refer to figure):</b>			
5.1.1)	<b>Engineering Check administrator or designee loads digital dataset to a unique, privilege restricted receive directory, where Customer DPD datasets are stored. A log is generated which lists time, date and ID of the DPD data loaded. All users are restricted from making any changes to datasets in the received directory. An original copy is maintained in the received directory for the duration of the project or until directed otherwise by the customer. New and revised DPD dataset's received from the customer are loaded into the same received</b>			

<p><b>directory. A verification of duplicates shall be accomplished at this time to ensure the new model is not identical to any previously stored datasets. If a new or revised DPD dataset with a duplicate name is identified it will be moved to the quarantine directory per 5.1.3.</b></p> <p><b>5.1.2) All directories that contain digital data or programs are password protected. Access for approved personnel is requested by management and if granted given to by the system administrator.</b></p> <p><b>5.1.3) The Engineering Check administrator or designee verifies digital dataset completeness and copies the digital dataset to the work directory as appropriate, if the digital dataset is deficient, written documentation of defect is given to contracts and the DPD is moved to the quarantine directory. Contracts will notify the customer of deficiencies and wait for disposition instructions for the dataset. A copy of all correspondence will be filed in the project file.</b></p> <p>5.1.4) Only those users in the work group will be allowed write access to the files located in the work directory. More then one-work directory may exist for a customer to facilitate segregation of projects within a customer base.</p> <p>5.2. <u>Development of CNC/CMM Programs:</u></p> <p>5.2.1) The Programmer develops the computer programs for CNC/CMM machines using the</p>			
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<p>latest released engineering. The program is assigned a unique number for each operation. A master log is keep on the Engineering server which indicates part number, rev letter, part name, customer and sequence of programs/operations.</p> <p>5.2.2) The person programming shall have the router, prints, and any documents needed for the manufacturing of the product.</p> <p>5.2.3) CNC Programs or Program Control Sheets shall consist of the following information:</p> <p>5.2.3)1. Part number and revision level</p> <p>5.2.3)2. Program number and version level</p> <p>5.2.3)3. Type of machine</p> <p>5.2.3)4. Special instructions (tooling /methods)</p> <p>5.2.3)5. Tools to be used (type, size, description)</p> <p>5.2.3)6. Data written or revised</p> <p>5.2.4) After producing acceptable products, as proven by performing FAI, the approved program shall be downloaded to the server as a read only file for future runs. Any approved program edits made during setup or run of any parts shall be</p>			
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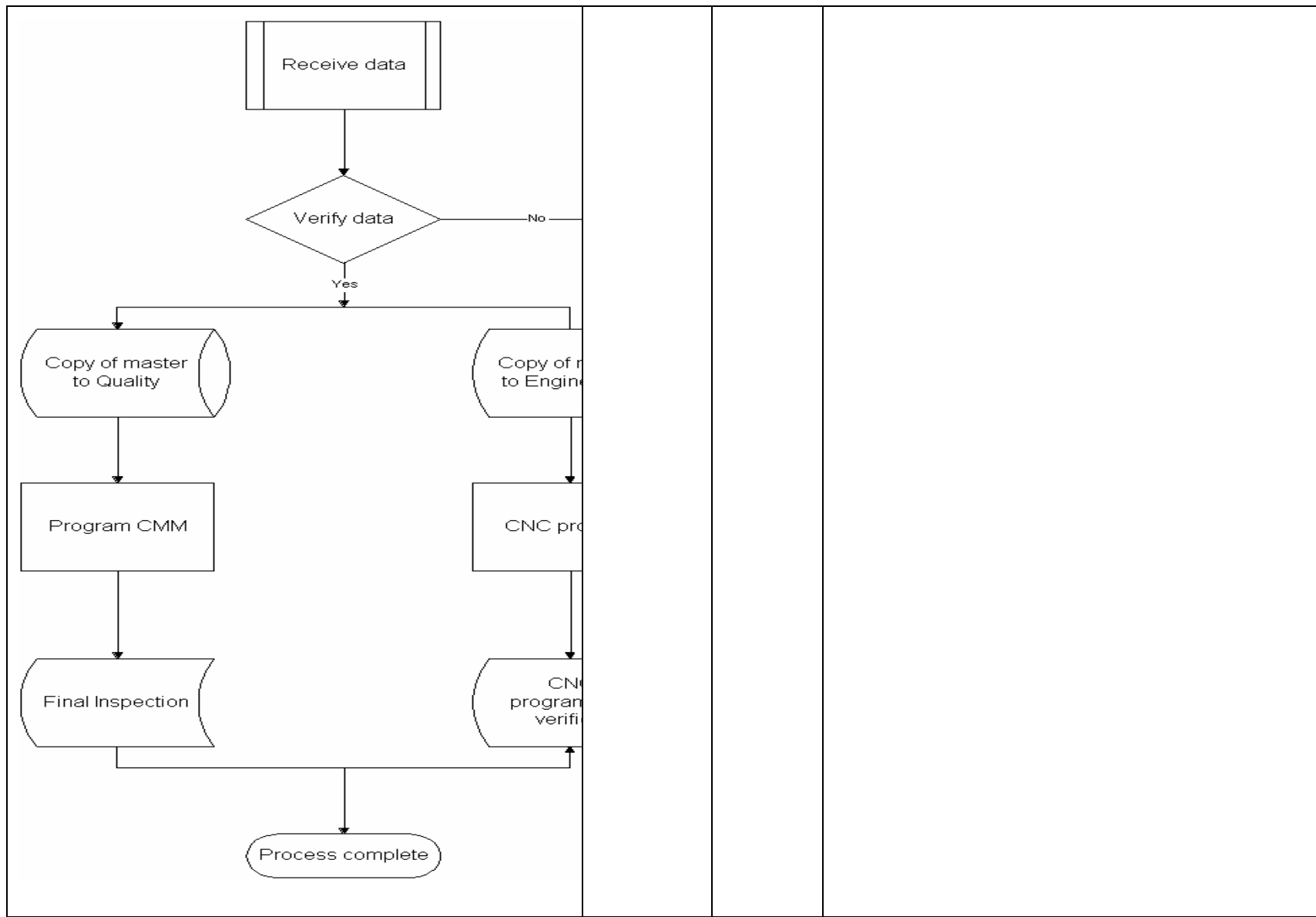
<p>incorporated into the master program prior to next run of the same part and revision letter.</p> <p>5.2.5) When a program exists on a previously produced product, the Engineering personnel shall insure that the revision level of the program is the same as the revision on the shop traveler.</p> <p>5.2.6) It is the Programmer's responsibility to make any required changes to the Program before the program is issued to production.</p> <p>5.2.7) When required by the customer application software, any changes shall be submitted for approval prior to use.</p> <p>5.3. <u>Use of CNC Computer Programs:</u></p> <p>5.3.1) Manufacturing shop travelers are released to authorize specific quantities of each part. The traveler contains the program number for manufacturing and/or inspection. The appropriate personnel has access to the Server where the files are stored as read only.</p> <p>5.4. <u>Inspection:</u></p> <p>5.4.1) The QC inspector generates points for the CMM independently using the approved latest released</p>			
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<p>engineering. The CMM program indicates the configuration base line used.</p> <p>5.4.2) The initial CNC programs are verified and accepted through FAI, or, first piece set-up inspection.</p> <p>5.4.3) Discrepancies that are noted during FAI using CMM Programs are reviewed. The Programmer determines the required changes that are needed to the machine program.</p> <p>5.4.4) Acceptance of the FAI indicates final acceptance of the program and authorizes the program for production use.</p> <p>5.4.5) Any Changes requiring revision to CNC/CMM computer programs require additional FAI verification and Quality Assurance stamp of the traveler after acceptance of FAI.</p> <p>5.4.6) Data sets translated for CMM by in house programming or sub-tier suppliers shall be traceable back to master data set and be accurate to .0005” in any axis measured.</p> <p>5.4.7) The inspector assures digital media, used for inspection of parts or tools, is initially and periodically inspected for accuracy or damage.</p>			
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<p><b>5.5 Derivative data in a non-digital format (e.g., paper drawings, Mylar plots, etc.) shall be traceable to the authority dataset they were derived from. The Engineering Manager is responsible for storage and control of non-digital derivative data created at Compucraft. This data shall be clearly marked as to its intended use, (e.g., check print, Draft etc.) and shall be traceable to the authority or digital derivative dataset it was derived. Deliverable non-digital data shall be inspected for quality to ensure that customer requirements are met prior to delivery. A letter of transmittal shall be prepared itemizing all deliverable items being delivered. A copy of this letter will be filled in the project file as a record.</b></p>			
<p><b>5.6 Customer supplied non-digital derivative data shall be controlled by engineering management. A record of receipt and disposition of customer supplied non-digital derivative data, ie.. PDF's, TIFF images etc. will be maintained on the network server as outlined above.</b></p>			
<p><b>5.7 Changes to the datasets received shall be properly maintained to provide accurate configuration control. Currently applicable revisions shall be maintained on the computer system and shall be backed up daily. When a</b></p>			

<p><b>new revision is received from a customer, the engineering programming department shall place the older revision into archives. Older revisions placed in archive must be properly segregated from current applicable revisions while kept in storage.</b></p> <p><b>5.8 Any changes to the previously approved CAD/CAM/CAI systems and or application software, including hardware/software used in the dataset transmission process shall be submitted to customer for approval prior to use. Approval request shall contain evidence that the proposed change will not degrade the integrity of the product, or the validity of the data representations.</b></p> <p><b>5.9 Any digital data received from the customer without evidence of being transmitted through the appropriate engineering release system shall be considered to be non-conforming.</b></p> <p><b>6). PROCESS FLOW DIAGRAM FOR PAS:</b></p>			
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**7). PROCESS FLOW DIAGRAM FOR  
RECEIVING DIGITAL DATA:**



**8). PROBLEM REPORTING AND CORRECTIVE ACTION**

**Programs that contain non-conforming CAD/CAM datasets, graphics and MDD/MDS and or extractions shall not be placed in the directory, which contains production-approved datasets until resolution with customer. Orders will be placed on constraint pending Customer resolution of problems.**

**The Engineering Check administrator or designee will report all problems and or discrepancies with software or datasets to contracts for notification to customer.**

**9). FACILITIES**

All CAD/CAM software equipment is located in the Engineering Department, which is maintained as a limited access facility. This facility is designed with the necessary controls and equipment to provide for security, manufacturer's requirements for environmental and power requirements.

**10). MEDIA SECURITY**

Original customer supplied data shall be secured and maintained in a locked cabinet for storage. To ensure integrity, write protected back-up copies of the original customer supplied data shall be maintained and secured in the IT department. Extracted and or self-generated definition data contained on the main CAD/CAM/CAI

computer system shall be password protected. The CAD/CAM Engineer shall control the reading and editing capabilities of users. A Backup copy of these extracted and self-generated datasets shall be maintained and secured in both the programming and IT Departments.

Read/Write Matrix:

Responsibility	Read/Write
CAD/CAM	R/W
Programming	R
Quality	R
Tooling	R

The CAD/CAM Engineer shall be responsible for all live storage of controlled data, read write protection, file access and archiving.

Back up of the computer system data storage shall be performed on a daily basis.

**11). PROCUREMENT CONTROL**

**Compucraft shall assume responsibility for the maintenance, change incorporation, use of datasets and observance of security restrictions by the sub-tier. The requirements of this document shall be flowed down to all sub-tier suppliers utilizing digital data.**

**Engineering Check administrator or designee following protocols set forth by configuration control of this document shall coordinate translation of digital data sets through outsourcing.**

The quality audit checklist shall be used to assess the capability of sub-tiers CAD/CAM systems. No data shall be released to the sub-tiers until an acceptable system is in place and approved.

Customer reserves the right to survey, approve and periodically review the CAD/CAM/CAI quality systems of these sub-tiers.

**12). CONTROL OF INSPECTION,  
MEASURING AND TEST EQUIPMENT**

**All inspection, measuring and test equipment, M&TE, utilized in the inspection and acceptance of manufactured products shall be calibrated at defined intervals, or prior to use, against certified equipment having a known valid relationship to the National Institute of Standards and Technology, (NIST), or equivalent, reference CP1101.**

The records of calibration and certification shall be maintained.

All M&TE shall be identified with a label or identification record to show the calibration status.

The plotter used to produce Mylar's, HP 1055cm plus is a self-calibrating device. The method to ensure continuing accuracy for Mylar's is to verify after print using grid lines imposed onto the Mylar, 5 inches in length, every plot. Inspection personnel are to perform

this service and upon acceptance of the measurement and validation of IGES data to plot place a signature on the Quality review block as objective evidence of inspection.

**13). INSPECTION MEDIA**

Media with inspection authority includes Engineering Drawing/plots, QAID printout, etc.. QAID extraction data obtained from customer must have Customer QA buy-off. QAID data, (array of points), converted to IGES by Customer is approved for inspection use.

**When datasets are used for inspection purposes any digital data extracted from those datasets, that is used for product acceptance shall be fully traceable back to the original engineering dataset.**

The QA department may delegate the inspection responsibility to a member of the programming department.

The QA department can be provided with a controlled copy of the dataset on disk from the supplied data to make an inspection program designated as such and to be independent of manufacturing programs.

Parts selected for inspection on the coordinate measuring machine, CMM, shall be verified via a CAD/CAM/CAI to CMM interface with an inspection program approved by quality control. This process assures independent verification of the NC tape utilizing the Engineering data of the CAD system.

<p>Data or datasets identified as “REFERENCE”/“UNCONTROLLED DATA” shall not be used for inspection purposes.</p> <p>IGES – For Boeing programs there is no authority with an IGES dataset. The meaning of IGES datasets in this paragraph relates to CAD geometric 2D and or 3D models translated between dissimilar CAD systems. When IGES data is received and a surface is controlled by an MDD/MDS, the customer approved QAID shall be used. QAID data may be extracted for each part number per section 12.0 and submitted for customer approval. Any additional media used for product acceptance must be extracted from approve QAID, and controlled and approved by quality assurance prior to use.</p> <p><b>14). CMM INSPECTION METHODS</b></p> <p>Data extracted from the customer supplied digital model will be verified using the following guidelines unless specified by customer requirements.</p> <ul style="list-style-type: none"><li>(1) There will be a minimum of one point per inch (or any fraction) of curves shorter than 5 inches. Three points minimum.</li><li>(2) If the curve is longer than 5 inches, a minimum of five points is to be verified. Point spacing on the curve is not to exceed 10 inches.</li></ul>			
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<p>(3) Points will have a maximum of 10 degrees of angular separation on curves or surfaces that are of a cylindrical nature. This requirement is in addition to the requirements based on the length of the curve.</p> <p>(4) Select a minimum of four points per surface unless the surface area is less than 2 square inches in which case three points are adequate.</p> <p>(5) Points will normally be .375 inch in from the nominal edges of the individual surfaces. This includes tangency between surfaces.</p> <p>(6) Points will be measured at inflections of surface tangency and at approximately 1 inch on either side of these inflections.</p> <p>(7) Minimums of five points are to be verified if the surface is larger than 5 inches by 5 inches or 25 square inches. Point spacing on the surface is not to exceed 10 inches.</p> <p>(8) If the surface has a profile tolerance of greater than .010</p>			
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<p>inch or less. A minimum of one point will be defined for each 5 square inches or as specified on drawing. A minimum of five points per surface is to be verified. Point spacing on the surface is not to exceed 5 inches.</p> <p>(9) If the surface has a profile tolerance of greater than .010 inch but less than .030 inch. A minimum of one point will be defined for each 10 square inches. A minimum of five points per surface is to be verified. Point spacing on the surface is not to exceed 7 inches.</p> <p>(10) Points should be located .10 to .25 from the EOP of mold line “surface patches”, and within .25 of changing mold line offset surfaces or from tangent points of transition whenever possible.</p> <p>(11) All mold line beveled surfaces must have at least two points to define the bevel. Any surface three inches or longer must have a point near the center to define any curvatures.</p> <p>(12) Rib and stiffener features must</p>			
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<p>have at least two points with a maximum spacing of 12 inches on all straight surfaces. Any angled tee from the basic web surface must have two rows of points to define the angle.</p> <p>(13) Any tapered ribs or stiffeners will have points on both sides defining the taper.</p> <p>(14) Any radial defined area must have a minimum of three points to assure it is dimensionally correct.</p> <p>(15) Any flange top feature will have two points minimum with a maximum spacing of 8 inches.</p> <p>(16) Any EOP that has a continuous straight-line surface must have a minimum of 1 point every 12 inches.</p> <p>(17) When possible, all points should be numbered starting from one end to form a continual chain to completely check one area (with like tolerances) with the least number of wasted moves before moving on to the next area or feature.</p>			
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**15). DATA EXCHANGE METHODS**

The IGES formats shall be utilized for the exchange of CAD data. The exchange medium is to be 3 ½ inch floppy disk at 1.4 megabytes, high density, for IBM PC compatible, with DOS, with ASCII characters, Zip disk at 100 Megabytes, or electronic transfer via FTP site or e-mail attachment, encrypted or non-encrypted.

Data verification shall be accomplished through comparison to customer furnished hard copy representation, if applicable.

The authority status, i.e.. Authority or reference, of the datasets shall be confirmed and safeguards governing their appropriate usage shall be established accordingly.

The system operator performing the exchange procedure will monitor the system messages for the successful verification and acceptance of the exchange data. The system operator has the authority to accept successful data, but will inform the CAD/CAM system Manager, or his designee, if the exchange is not successful. The resolution of an unsuccessful exchange will be as follows:

- Determine if the problem is with Compucraft equipment. If yes follow section V.
- Notify the Customer listed on the exchange media to determine if the problem can be resolved quickly and informally.
- Implement procedures of section V.

**16). REVIEWS AND AUDITS**

The internal audit group will conduct reviews and audits of the CAD/CAM QA plan annually. The CAD/CAM system Manager, or designee, will assist the review and audit by providing information and operating the system if required.

The review and audit shall assure compliance with contract requirements, software level with D6-51999, QA 111, SQAR or other customer requirements or written approval, Quality standards and security requirements in accordance with section VII.

**17). TOOLING**

Tooling designed, fabricated and or revised from CAD/CAM/CAI generated programs, shall be traceable to the corresponding dataset through a unique work order number.

Accountable tools, CTL, will be identified with the original dataset number and all applicable serial numbers, reference CP 1102.

**18). TRAINING**

Training associated with this procedure shall include on the job activities performed in addition to the review and understanding with a record of review to this procedure

as evidence of training provided. All system updates, system interfaces and application programs will be under the cognizance of the CAD/CAM System Manager, or his designee. As required, the CAD/CAM System Manager will provide personnel with on the job training and formal training, reference CP 1801.

**19). RECORDS**

Quality records associated with the CAD/CAM/CAI systems shall be maintained to demonstrate compliance with contractual requirements. Records shall be legible and shall be stored and retained in such a way that they are readily retrievable in facilities that provide a suitable environment to prevent damage or deterioration and to prevent loss.