CAD & Documentation

Design documentation is used for technical communication and comes in many forms, including:

- Free hand sketches
- Constructed drawings (using drawing instruments)
- 2D CAD drawings
- 3D CAD models

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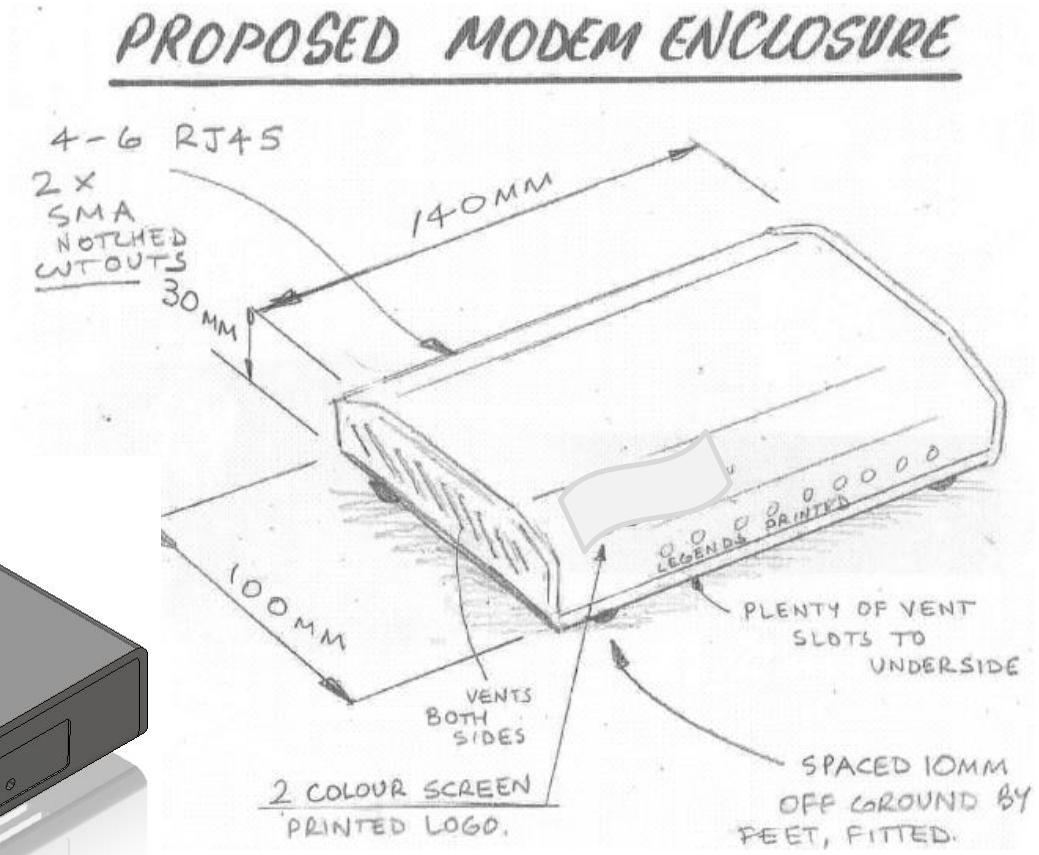
Free hand sketches

Often used to communicate conceptual design intent to Design Engineers, who will work on a more detailed specification and documentation.



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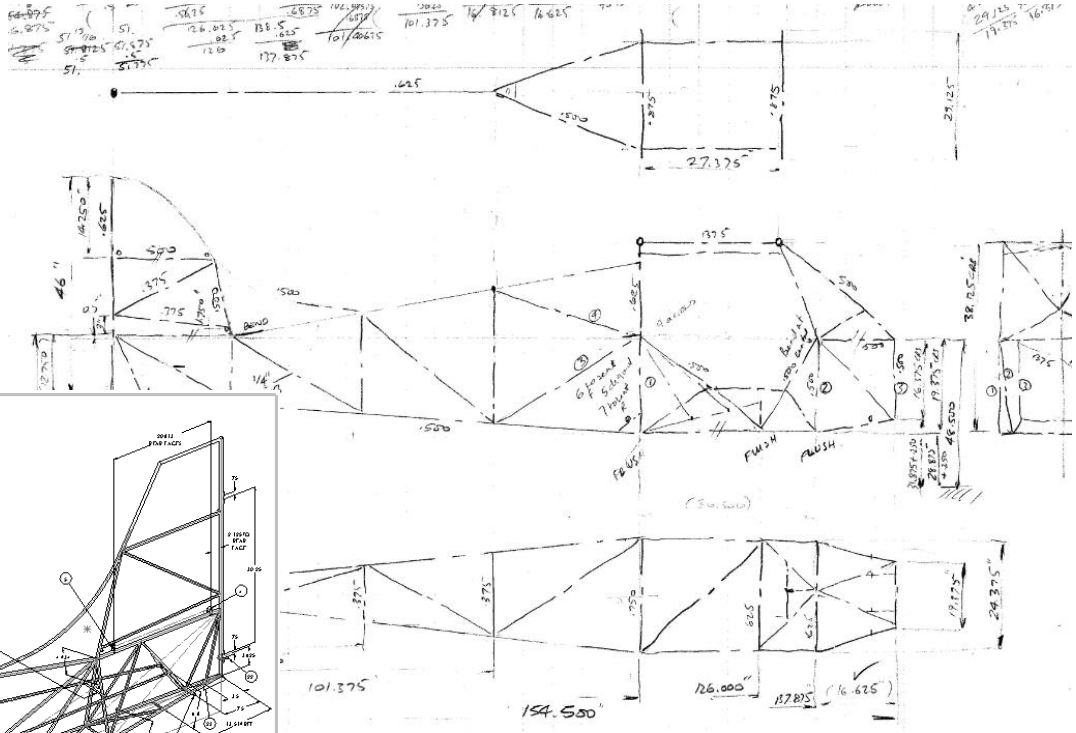
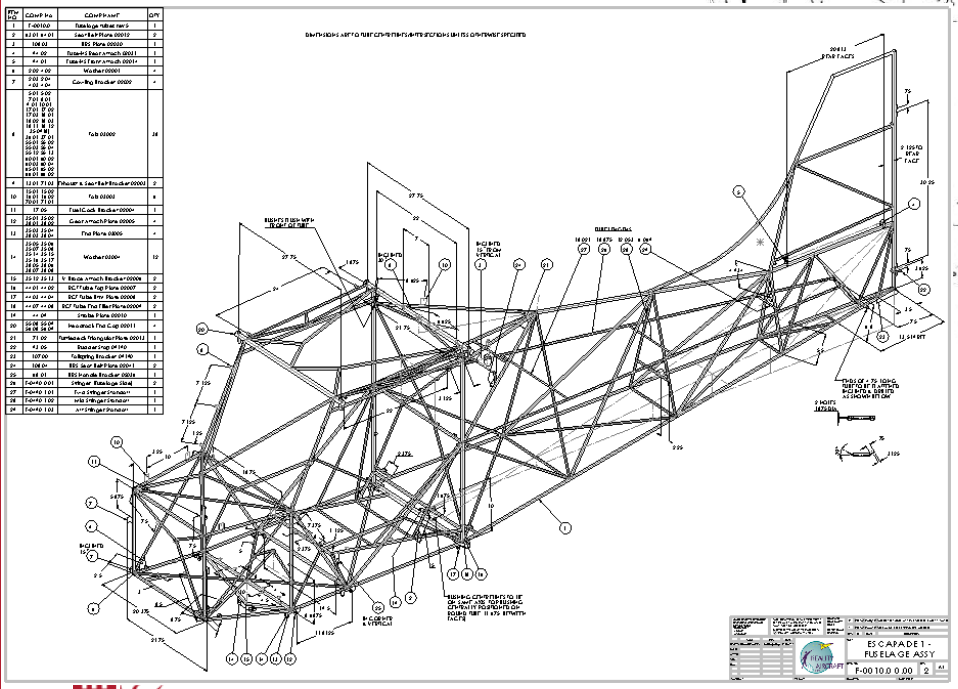
Free hand sketches

Also used on survey, to record form and measurements of existing products, prior to creating CAD drawings or models for further development





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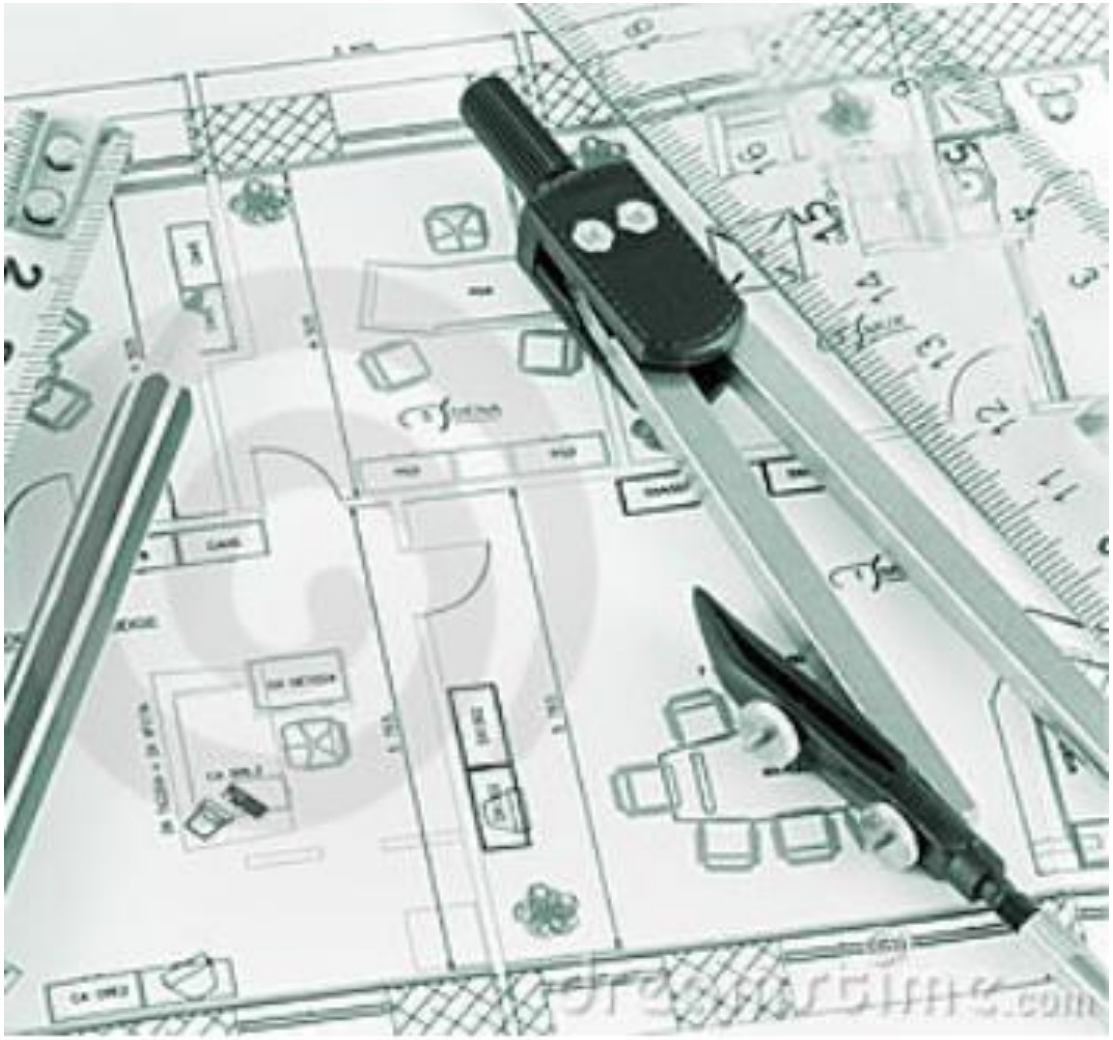
Constructed drawings

Little used these days but many legacy designs remain on paper only, having been manually created on drawing boards with drawing instruments (set squares, compasses, pencils, etc.)



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Early Drawing Offices

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Gradual introduction of CAD

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CAD workstations

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2D CAD drawings

Many companies use 2D CAD systems, such as AutoCAD and Draftsight to create the equivalent of manually constructed drawings using computer software.

There are many advantages to the computer aided approach:

- Clarity of line work and text (leading to smaller sheet sizes)
- Electronic transfer – paperless drawings?
- Easier modification
- Rapid creation of variants
- Consistency of style and compliance with standards
- Embedded information (e.g. measurements not specified as dimensions)

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2D CAD drawings vs. 3D CAD models

Generally, a 3D CAD model delivers more benefit than a 2D drawing, but there are times when a 2D drawing is more appropriate. The following slide illustrates an example.

The 3 view aircraft General Assembly drawing delivers the specific information that is required of it without the complication of 3D parts and assemblies, takes less time to produce and is readily understood by it's intended audience:-

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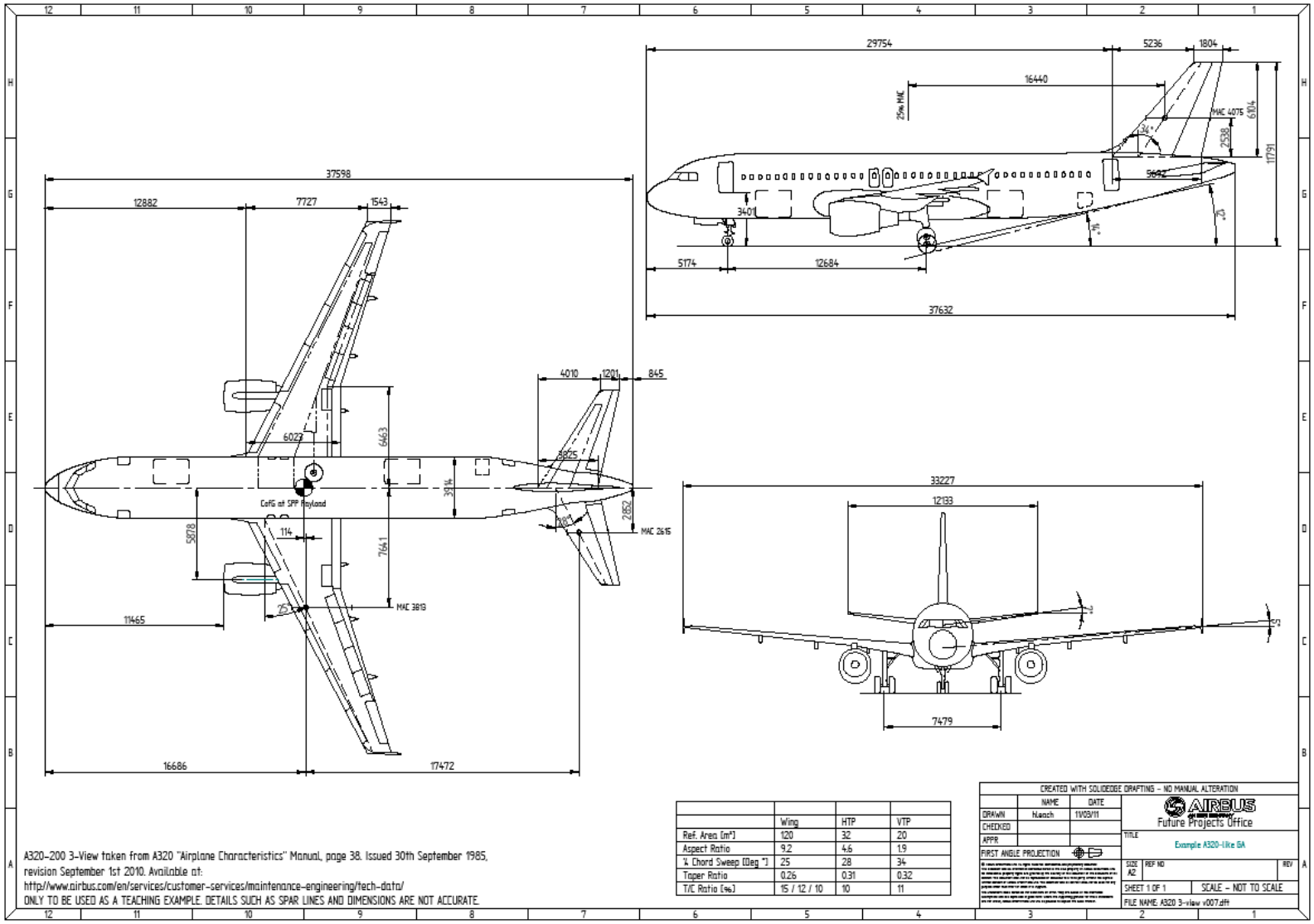
Airbus GA drawing



A320-200 3-View taken from A320 "Airplane Characteristics" Manual, page 38. Issued 30th September 1985, revision September 1st 2010. Available at:
http://www.airbus.com/en/services/customer-services/maintenance-engineering/tech-data/
ONLY TO BE USED AS A TEACHING EXAMPLE. DETAILS SUCH AS SPAR LINES AND DIMENSIONS ARE NOT ACCURATE.

	Wing	HTP	VTP
Ref. Area [m²]	120	32	20
Aspect Ratio	9.2	4.6	1.9
¼ Chord Sweep [Deg °]	25	28	34
Taper Ratio	0.26	0.31	0.32
T/C Ratio [%]	15 / 12 / 10	10	11

CREATED WITH SOLIDEDGE DRAFTING – NO MANUAL ALTERATION

	NAME	DATE
DRAWN	Nanch	11/05/11
CHECKED		
APPR		

FIRST ANGLE PROJECTION

AIRBUS Future Projects Office

TITLE: Example A320-like GA

SIZE A2 | REF NO | REV A

SHEET 1 OF 1 | SCALE – NOT TO SCALE

FILE NAME: A320 3-view v007.dft

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2D CAD drawings vs. 3D CAD models

It is not uncommon for companies to have both 2D and 3D systems and to use whichever is most suited to the task.

However, if you only have a 3D system, e.g. Inventor, it is possible to create a 2D drawing, but you must create a full size sketch in a part file (.ipt) and place it as a scaled down view in a drawing file (.idw or .dwg).

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3D CAD models and drawings

3D CAD models can be used to solve design problems or uncertainties, and are a valuable visualisation and design verification and approval tool. The latter is referred to by software vendors as “Digital Prototyping” or “Virtual Prototyping”.

CAD models can go a stage further and be used for Rapid Prototyping, where a physical model is generated directly form an “stl” (stereolithography) file, exported from the CAD model. This process is also known Additive Manufacture, as opposed to Subtractive Manufacture where material is removed by machining.

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3D CAD models and drawings

CAD software comes in many forms. Simple systems create single part models that are difficult to modify. More sophisticated systems like Inventor, SolidWorks, NX and Catia are feature based, parametric and contain a modelling history enabling changes to be made at any point in the model's creation. They also allow assembly modelling, motion and mechanical analysis and the creation of associative drawings.

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3D CAD software

A new arrival on the 3D CAD market is Direct Modelling. This type of system aims to allow modifications to a model outside of the constraints of a modelling history.

It has the advantage of increased flexibility and accepts models from other CAD packages more successfully (history based packages lose their modelling history during translation and deliver “dumb” models).

The main disadvantage **is** the lack of the history, which provides a structure, and some design rules within it’s modelling precedence.

It is early days and the jury is still out.

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3D CAD output

- A realistic model for visualisation
- Associative drawings with reduced user effort
- Export to Computer Numerical Control (CNC) programming systems for paperless (almost!) manufacture
- Export to Rapid Prototyping systems
- Documentation for technical manuals, e.g. exploded assemblies
- Export to FEA software (the CAD package may have some FEA functionality itself)
- Animations, e.g. http://www.youtube.com/watch?v=TmEkUad69D8

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