

Advanced Aerospace Assembly Ltd

Real Time Metrology Feedback Through Augmented Reality

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Overview

This presentation describes the project to develop DirectProject.
The goal of this project was to:

“Develop a means of accurately showing the deviation from nominal on an actual part or structure”

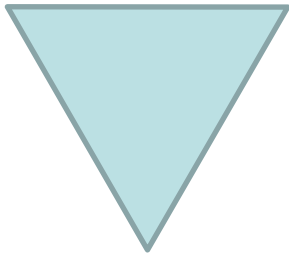
Stake Holders



UK
Distributor and Integrator

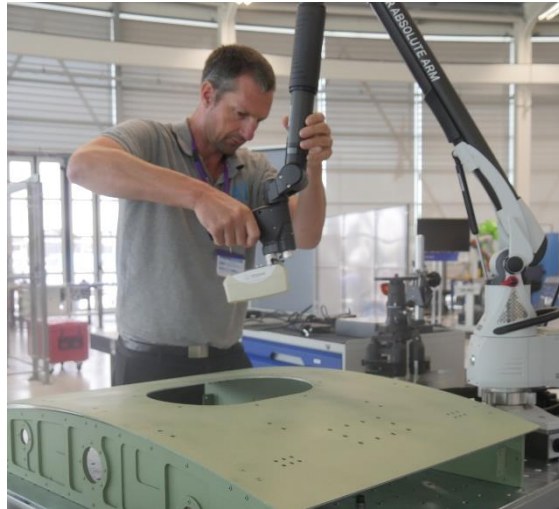
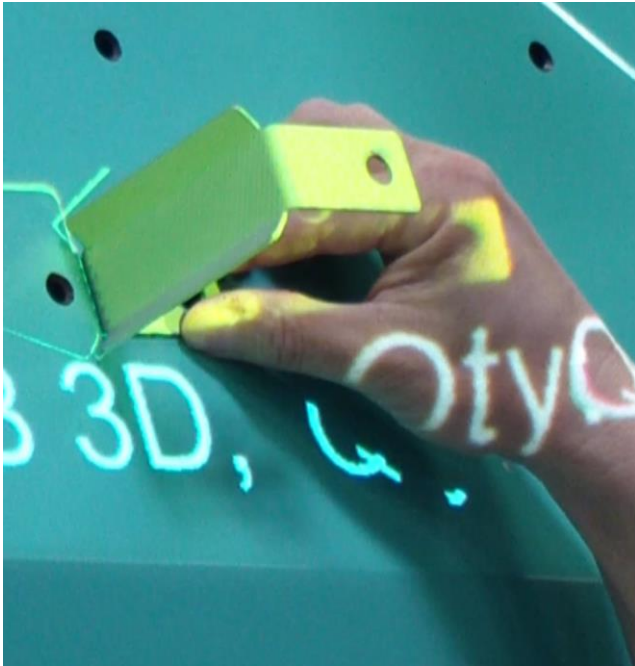


USA
Developer & Supplier



A³L Summary

A3L are a technology focused organisation delivering enhanced solutions within 3 core areas:



What is Augmented Reality ?



Tablets and mobile devices



Augmented reality

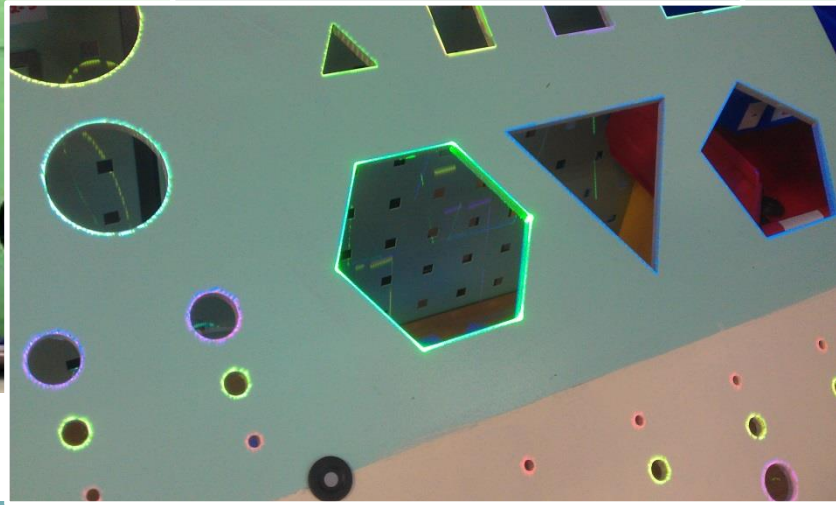
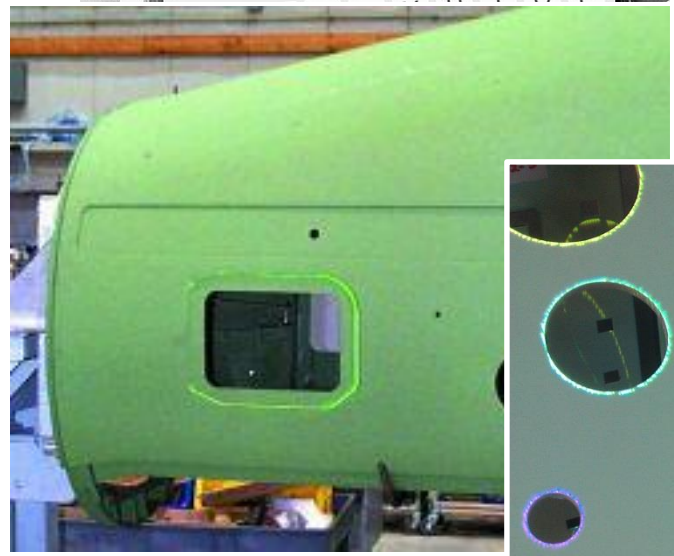
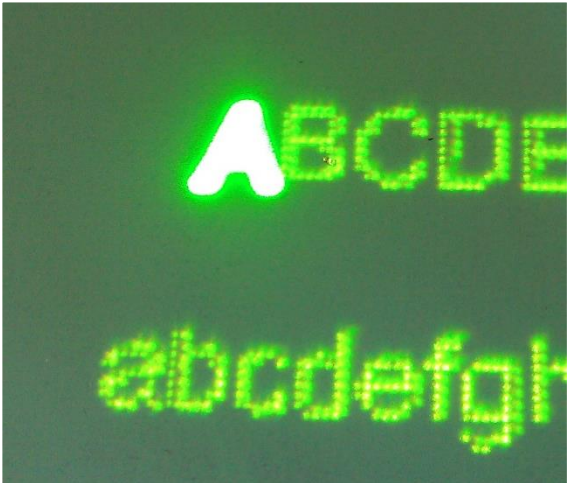
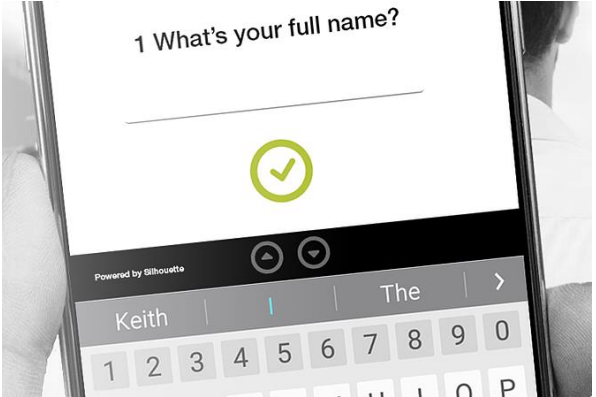


Heads Up display



Projection

Projection & Augmented Reality

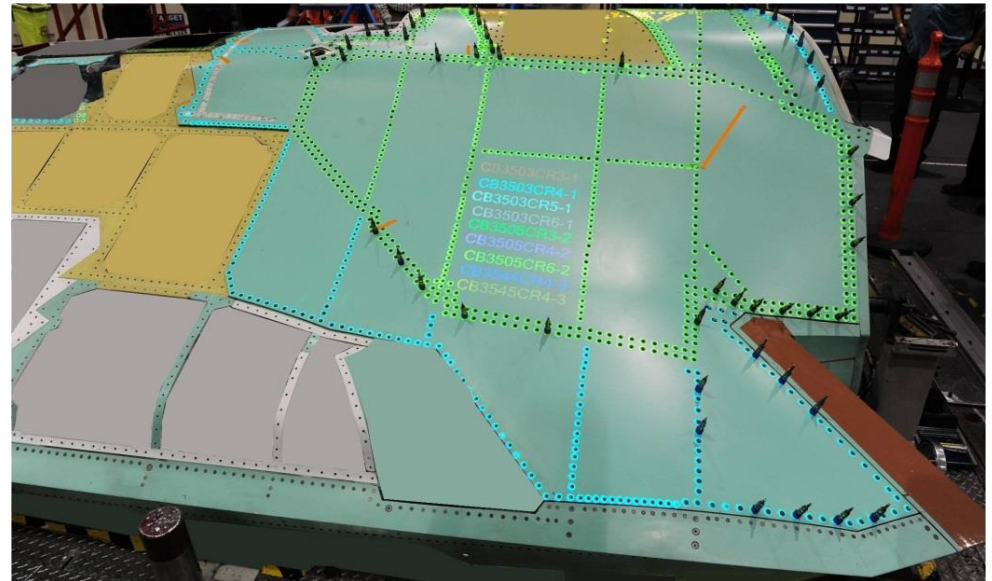


Optical Projection?

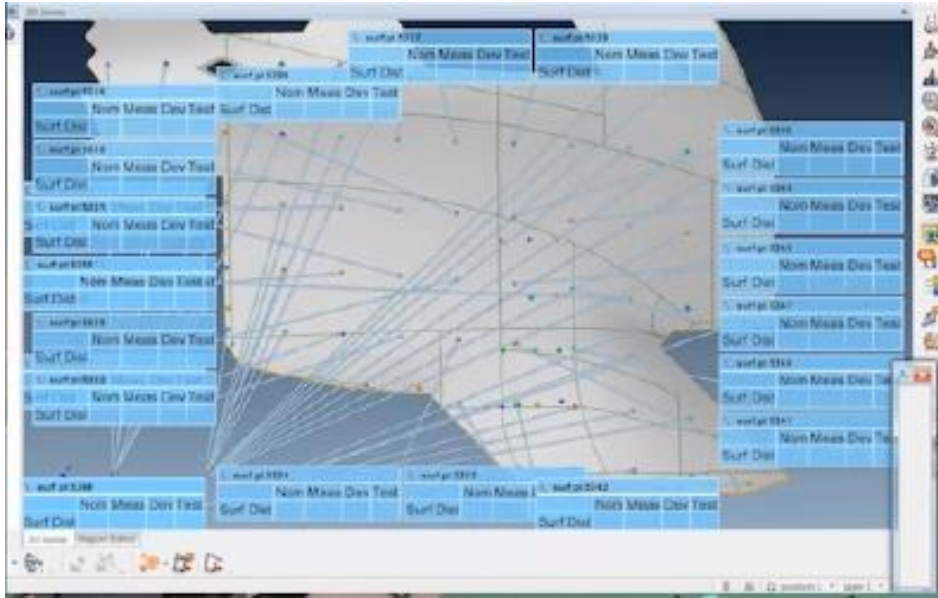


Optical Projection is a hardware/software system that uses standard boardroom projectors to display manufacturing information directly onto the 3D part:

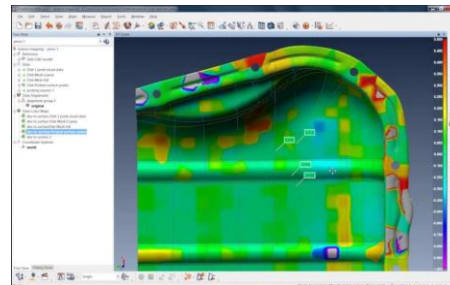
- Fastener locations
- Text (Part Numbers)
- Alignment of nutplates/seals/brackets
- Sealant/adhesive application areas
- Masked areas



Aim



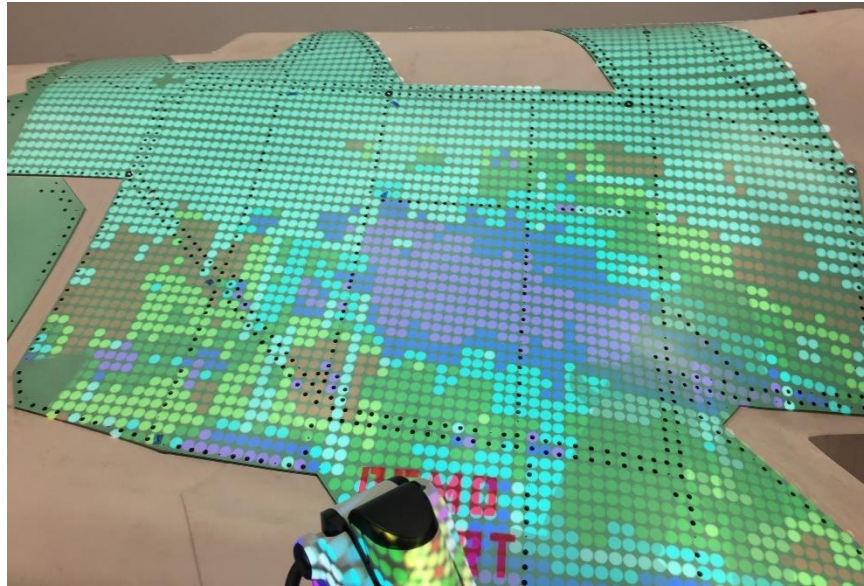
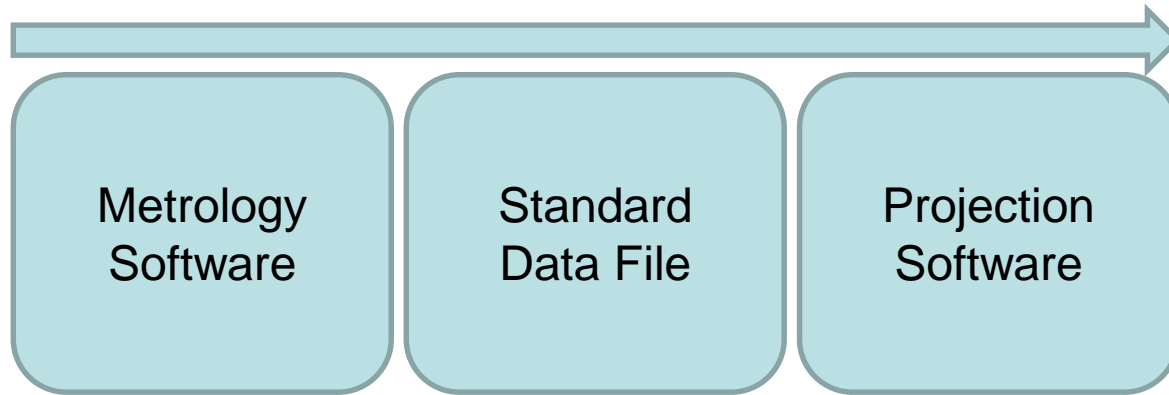
Metrology data onto the part



Why?

- Understanding exactly what you have can be very beneficial in certain applications
 - Non-Destructive Testing (NDT)
 - Ultrasonic, X-ray, ...
 - Delamination, Cracks, ...
 - Custom fitting of components
 - Measure, alter and fit as opposed to fit, alter, refit, alter.....
 - Shimming or grinding / abrasion
 - Improving the ultimate tolerance
 - Visualisation of error
 - Step and Gap
 - Countersink depth / head flushness
 - Surface deviation

How?



Metrology Software

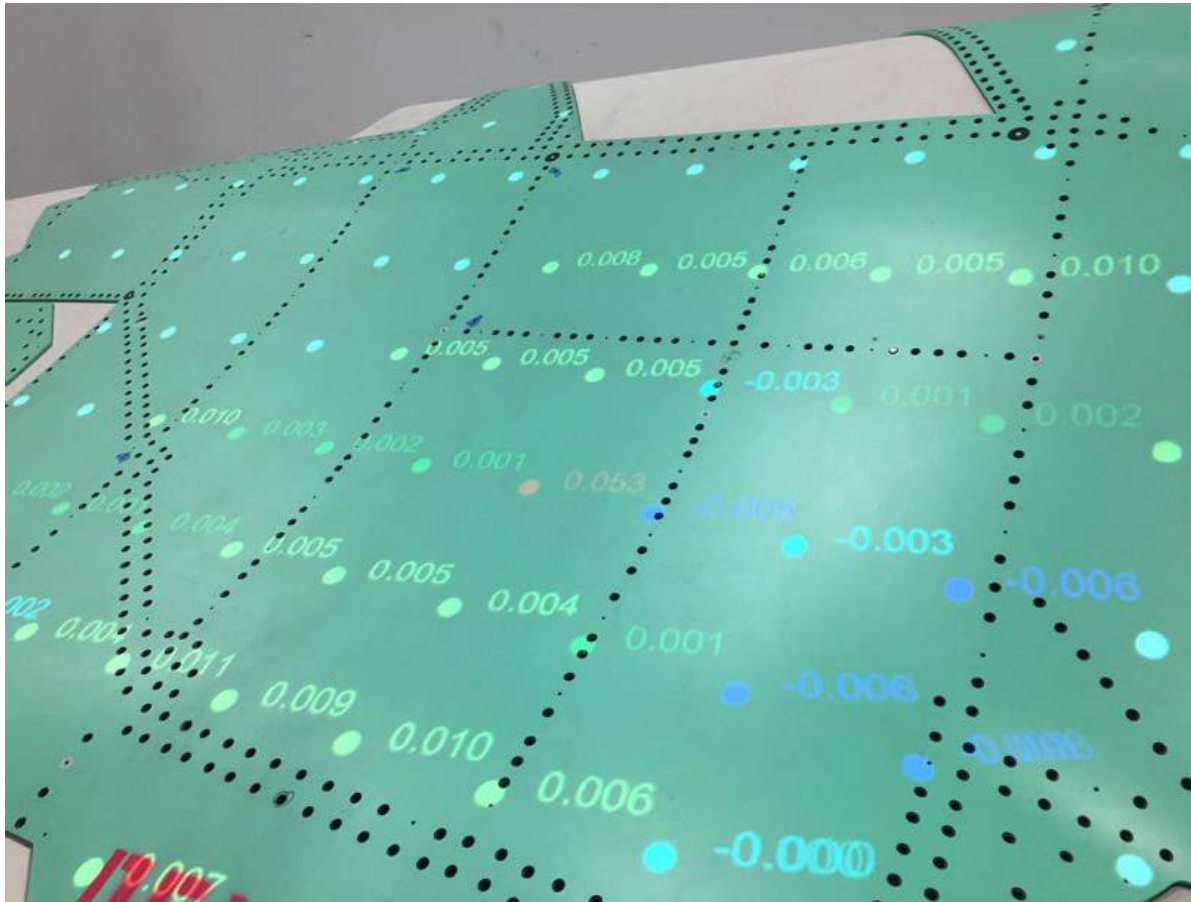
- Spatial Analyzer
- Polyworks
- Verisurf



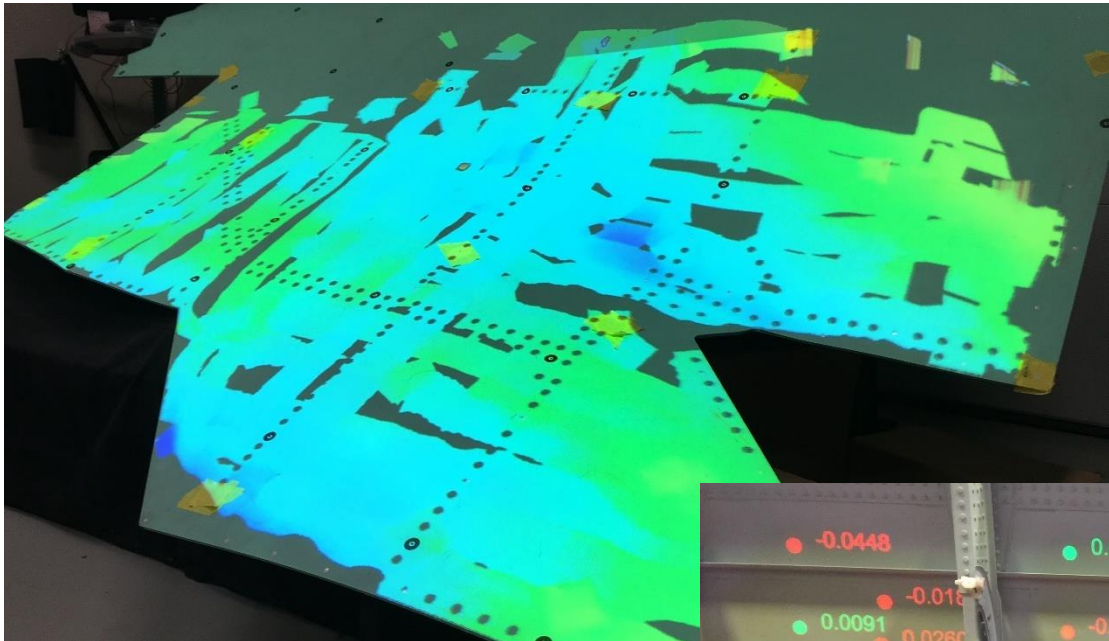
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V
1	x	y	z	i	e	k	deviator	r	g	b	major_d	minor_d	shape	rotation	start_ang	end_ang	line_wid	fill_solid	fill_r	fill_g	fill_b	
2	288.704	62.0439	98.1695	-0.0804	0.49771	0.86361	125696V	64	224	208	0.6	0.6	Circle				0.1	Yes	255	255	0	
3	287.4	61.9488	98.097	-0.0878	0.4865	0.86925	125696V	64	224	208	0.6	0.6	Circle				0.1	Yes	255	255	0	
4	286.097	61.8534	98.0129	-0.095	0.47415	0.8753	MS21140	64	224	208	0.6	0.6	Circle				0.1	Yes	255	255	0	
5	284.794	61.7577	97.9179	-0.1019	0.46064	0.88172	MS21140	64	224	208	0.6	0.6	Circle				0.1	Yes	255	255	0	
6	283.493	61.6618	97.8122	-0.1086	0.44599	0.88843	MS21140	64	224	208	0.6	0.6	Circle				0.1	Yes	255	255	0	
7	282.192	61.5658	97.6964	-0.115	0.43014	0.89541	MS21140	64	224	208	0.6	0.6	Circle				0.1	Yes	255	255	0	
8	280.892	61.4696	97.5708	-0.1211	0.41308	0.90261	MS21140	64	224	208	0.6	0.6	Circle				0.1	Yes	255	255	0	
9	279.593	61.3734	97.4359	-0.1269	0.39481	0.90996	MS21140	64	224	208	0.6	0.6	Circle				0.1	Yes	255	255	0	
0	278.326	61.2792	97.295	-0.1354	0.37465	0.91723	MS21140	64	224	208	0.6	0.6	Circle				0.1	Yes	255	255	0	
1	277.06	61.1861	97.1369	-0.1484	0.35761	0.92201	MS21140	64	224	208	0.6	0.6	Circle				0.1	Yes	255	255	0	
2	275.797	61.0955	96.9583	-0.164	0.34704	0.9234	MS21140	64	224	208	0.6	0.6	Circle				0.1	Yes	255	255	0	
3	274.521	60.6642	96.9065	-0.1725	0.34976	0.92082	MS21140	64	224	208	0.6	0.6	Circle				0.1	Yes	255	255	0	
4	273.48	60.0855	96.9084	-0.181	0.35246	0.91816	MS21140	64	224	208	0.6	0.6	Circle				0.1	Yes	255	255	0	
5	272.341	59.5062	96.9008	-0.1895	0.35188	0.91667	MS21140	64	224	208	0.6	0.6	Circle				0.1	Yes	255	255	0	
6	271.074	58.8613	96.8785	-0.199	0.34676	0.91661	125696V	64	224	208	0.6	0.6	Circle				0.1	Yes	255	255	0	
7	269.627	58.1228	96.8308	-0.2098	0.33419	0.91885	125696V	64	224	208	0.6	0.6	Circle				0.1	Yes	255	255	0	
8	272.164	55.78	98.2538	-0.2193	0.32087	0.92137	MS21140	64	224	208	0.6	0.6	Circle				0.1	Yes	255	255	0	
9	274.292	53.8208	99.4402	-0.2276	0.31023	0.923	MS21140	64	224	208	0.6	0.6	Circle				0.1	Yes	255	255	0	
0	277.974	50.4309	101.478	-0.2394	0.29336	0.92553	MS21140	64	224	208	0.6	0.6	Circle				0.1	Yes	255	255	0	
1	278.963	49.5201	102.021	-0.242	0.2892	0.92617	MS21140	64	224	208	0.6	0.6	Circle				0.1	Yes	255	255	0	
2	279.97	48.5924	102.573	-0.2444	0.28513	0.92681	MS21140	64	224	208	0.6	0.6	Circle				0.1	Yes	255	255	0	
3	282.635	46.138	104.024	-0.2493	0.27508	0.92854	MS21140	64	224	208	0.6	0.6	Circle				0.1	Yes	255	255	0	
4	283.592	45.2563	104.541	-0.2506	0.27172	0.92919	MS21140	64	224	208	0.6	0.6	Circle				0.1	Yes	255	255	0	
5	270.497	57.3139	97.3218	-0.2126	0.32886	0.92015	125696V	64	224	208	0.6	0.6	Circle				0.1	Yes	255	255	0	
6	271.18	56.6853	97.704	-0.2153	0.32562	0.92065	125696V	64	224	208	0.6	0.6	Circle				0.1	Yes	255	255	0	
7	273.202	54.8238	98.8335	-0.2235	0.31573	0.92215	MS21140	64	224	208	0.6	0.6	Circle				0.1	Yes	255	255	0	
8	276.354	51.9226	100.584	-0.2347	0.30005	0.92447	MS21140	64	224	208	0.6	0.6	Circle				0.1	Yes	255	255	0	
9	275.331	52.8637	100.017	-0.2313	0.30523	0.92376	MS21140	64	224	208	0.6	0.6	Circle				0.1	Yes	255	255	0	



Guiding Measurements



Displaying Data

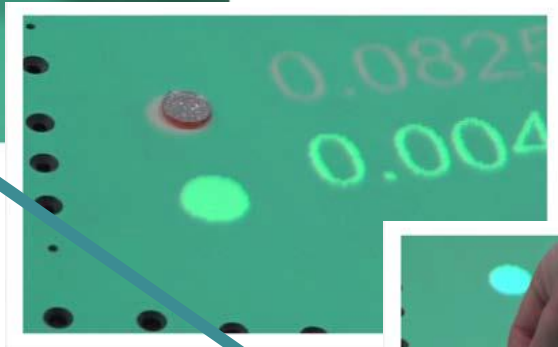


In Process Verification

Process



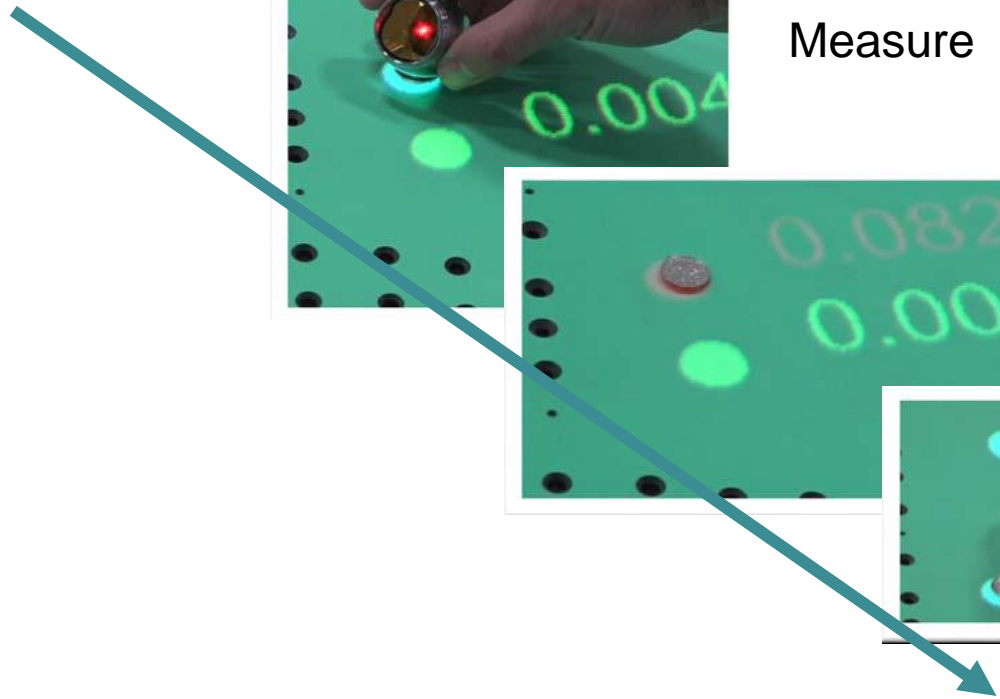
Measure

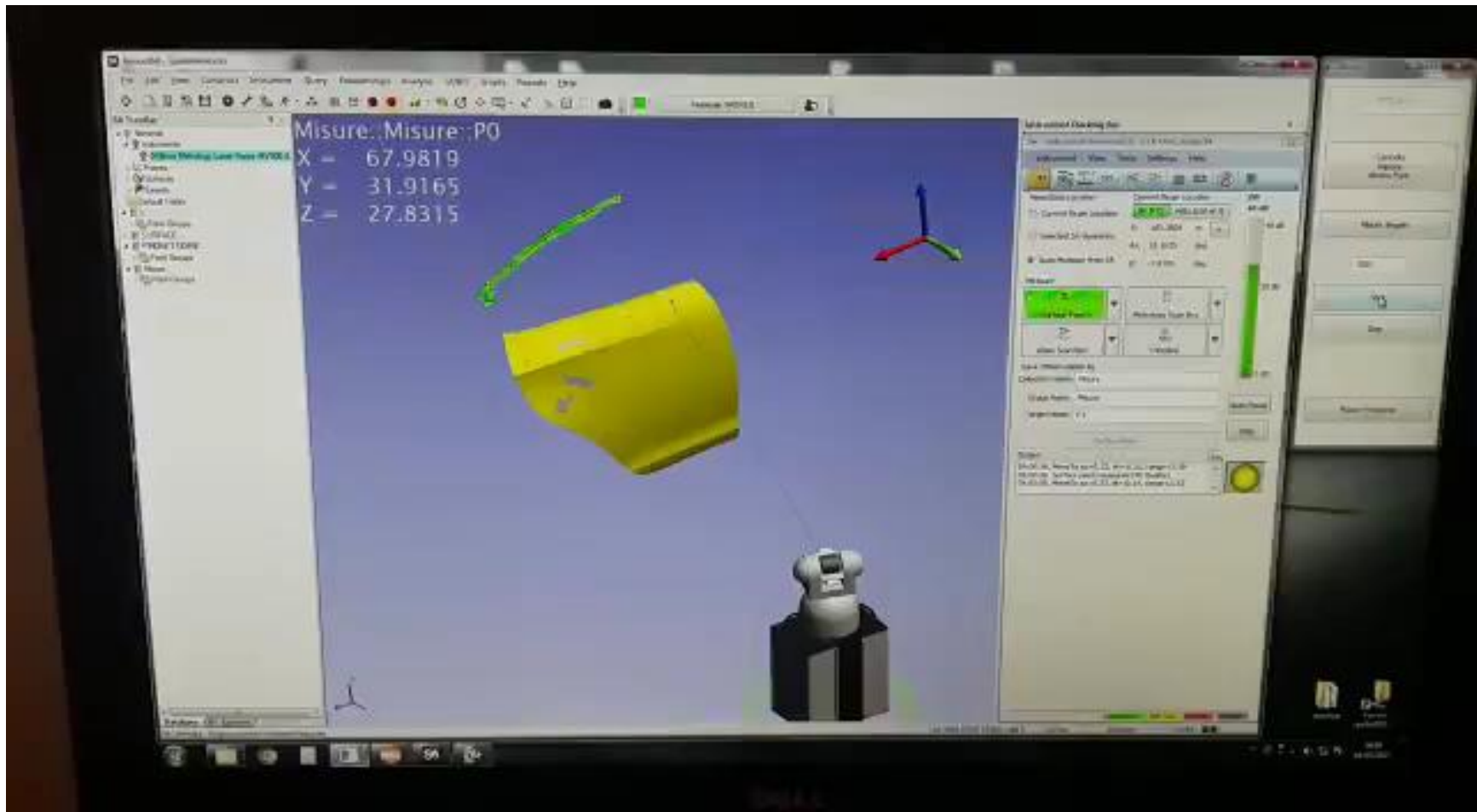


Fail



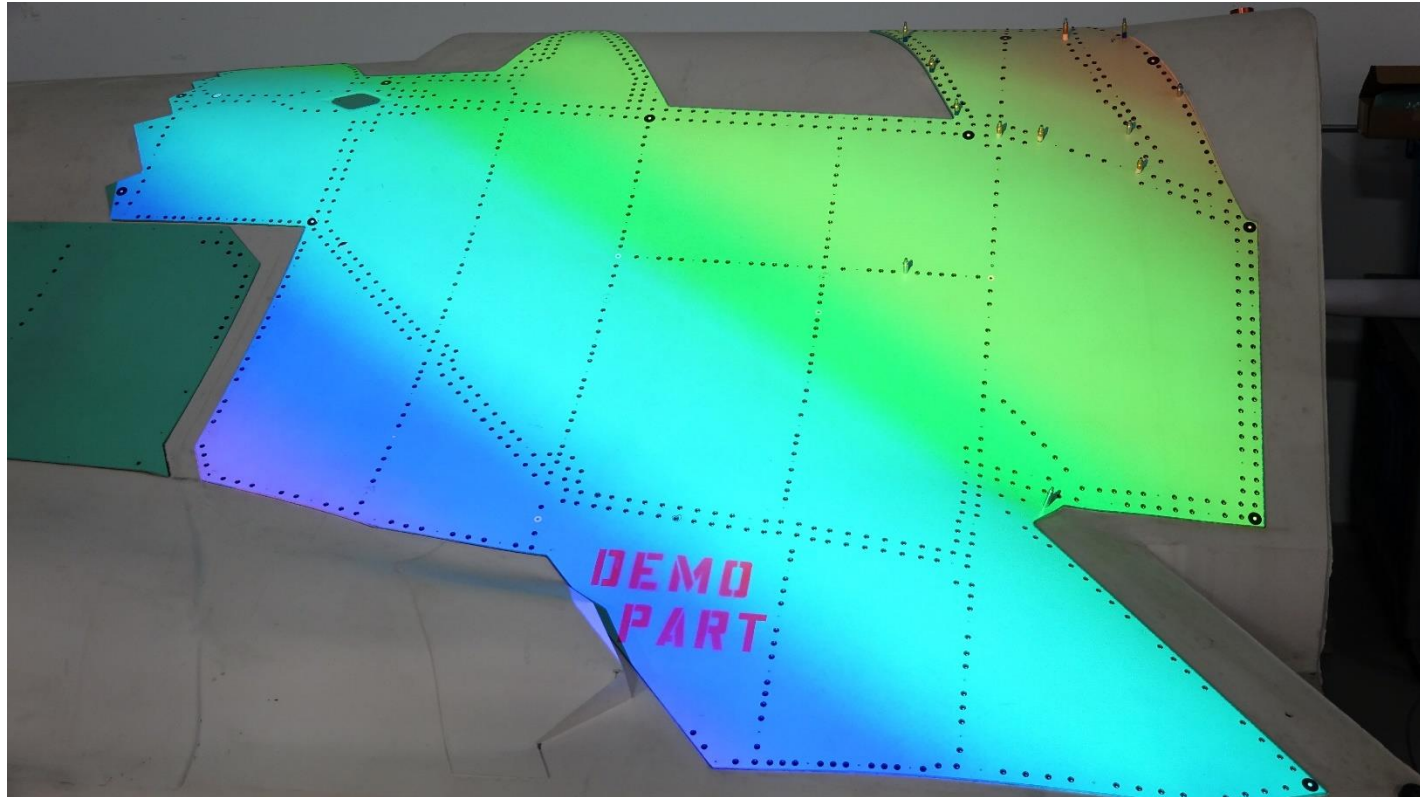
Correct





Future Work

- The system needs further work for the projection of VRML files.



Projection Applications

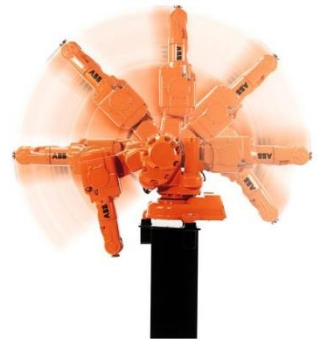


Conclusions

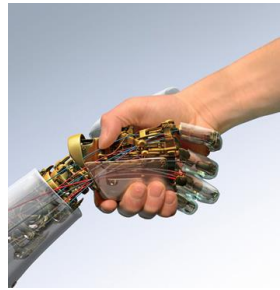
Manual



Full Automation



Semi Automation



Conclusions

- We have developed a system that can overlay metrology information on the real part as was the goal.
- The system does not suit all applications but several have been high lighted where it generates significant value.
- We have demonstrated the system using Spatial Analyzer, Polyworks and Verisurf but we believe it could be used with most metrology software and hardware.
- This is another step forward in the digital manufacturing evolution. It's another aid in crossing the digital gap created when using people in the process (very common in metrology applications) it facilitates the transfer of digital data and its visualisation.

Thank you!

**Any questions
?**

**Please talk to us we have a
booth here**

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