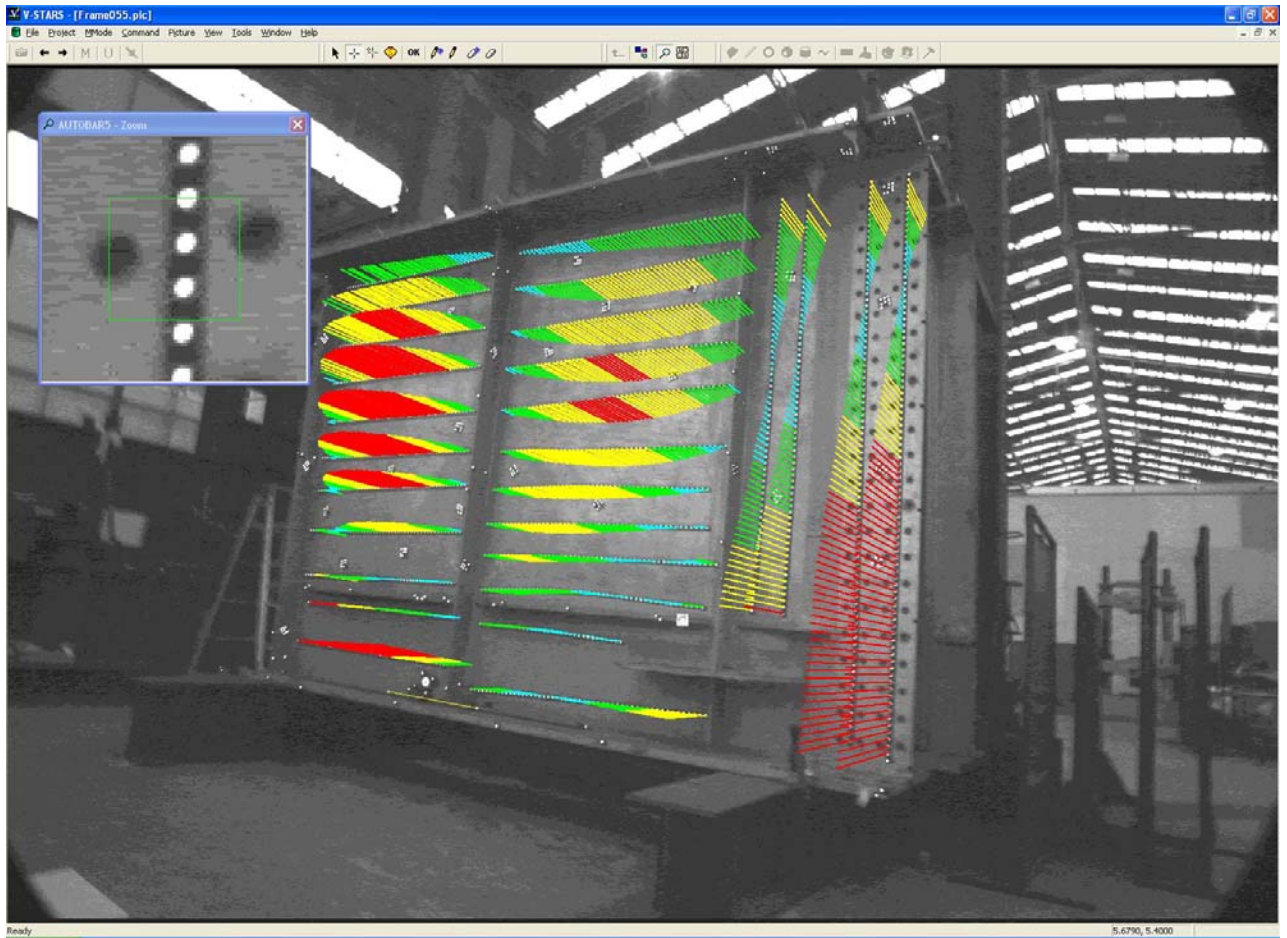




V-STARS E3X Demonstration



MAY 2003

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Object Measured

One object was measured as part of the V-STARS E3X demonstration. The object was a part of a bridge. An image of the object is shown on the cover of this report.

Equipment Used

1. V-STARS E3X Camera System
2. Various targets
3. Scale Bar



Objectives

1. Demonstrate camera use and object targeting
2. Calculate key dimensions
3. Determine angular relationships between planes
4. Determine surface plane deviations and display as color map

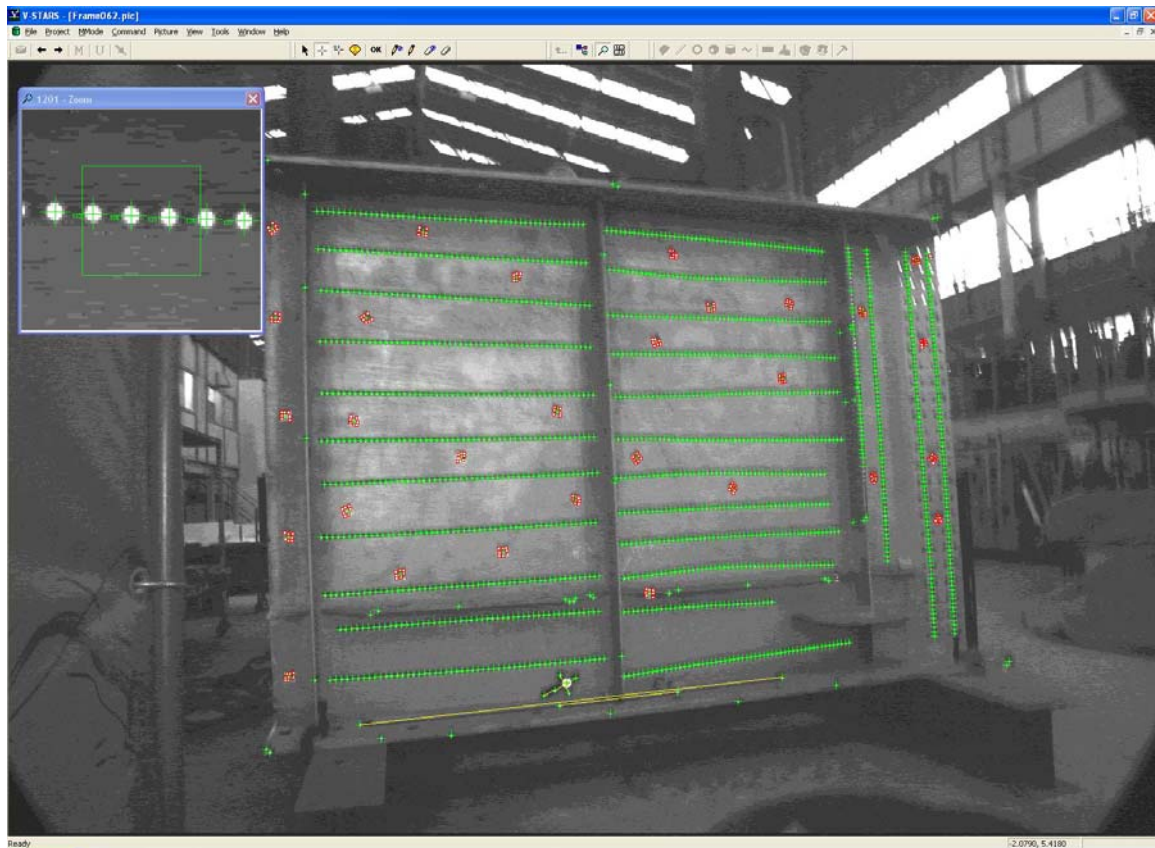
Targeting

1. AutoBar for initial coordinate system.
2. Coded targets to tie photography together.
3. Targets on key planes and lines
4. Strip targets on surface
5. Two scale bars.

Measurement Statistics

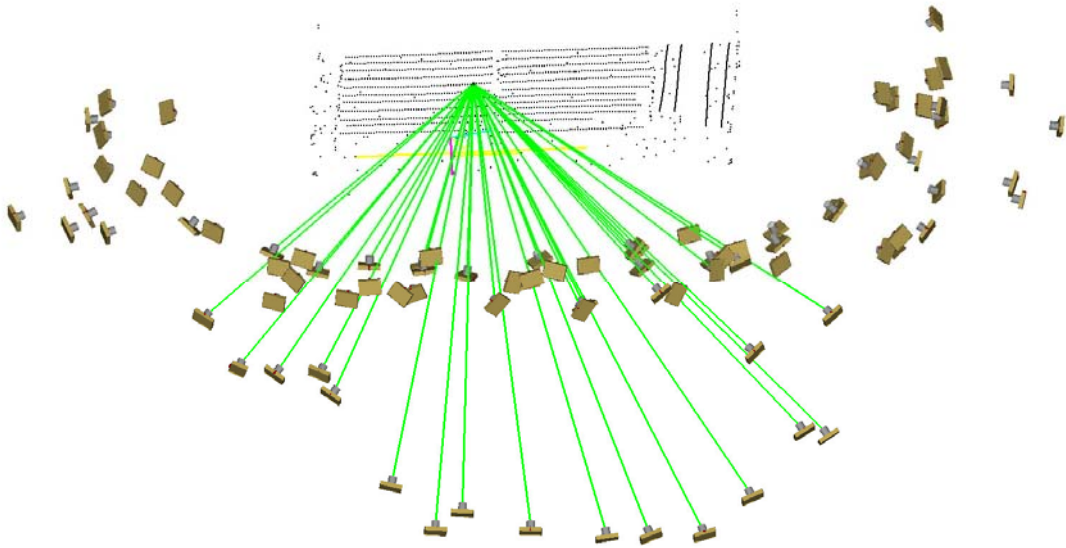
Network

No. of photos	94
No. of points	1790
Accuracy RMS X,Y,Z	X 0.011
	Y 0.009
	Z 0.010

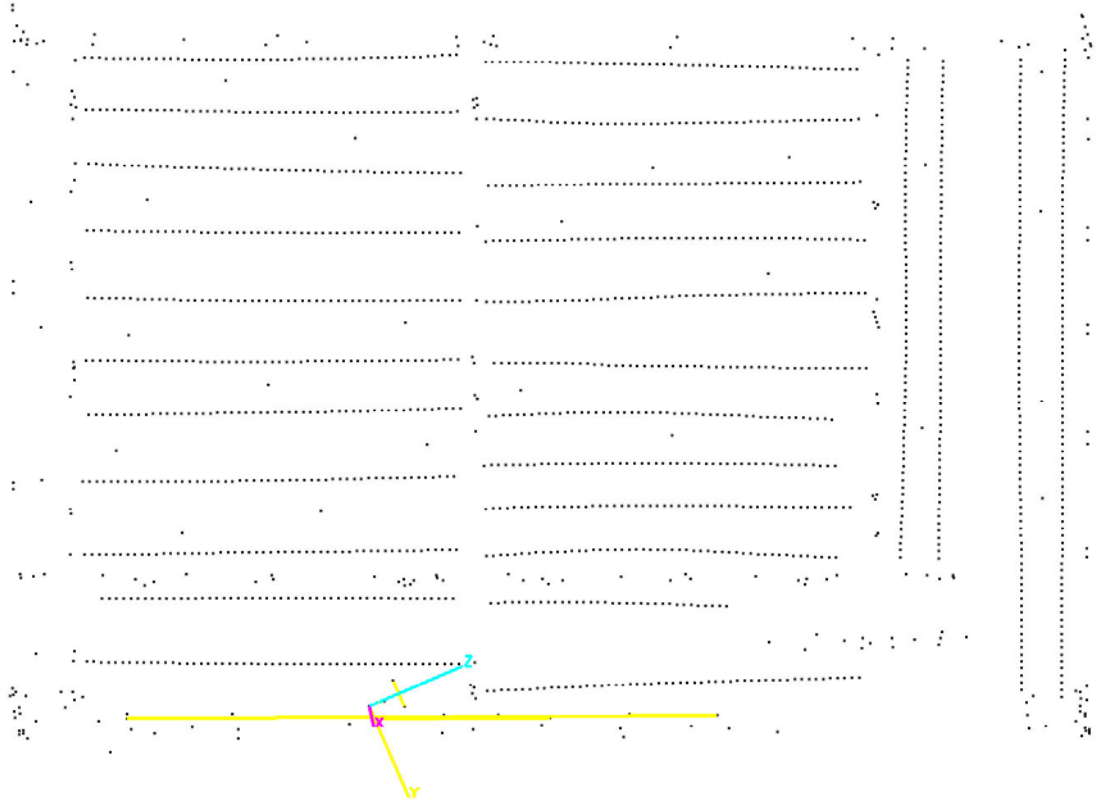


Typical V-STARS measurement image

The diagram below illustrates the geometry used to create the point cloud. A point has been highlighted to show the measurement observations (rays) used to determine its XYZ coordinate.



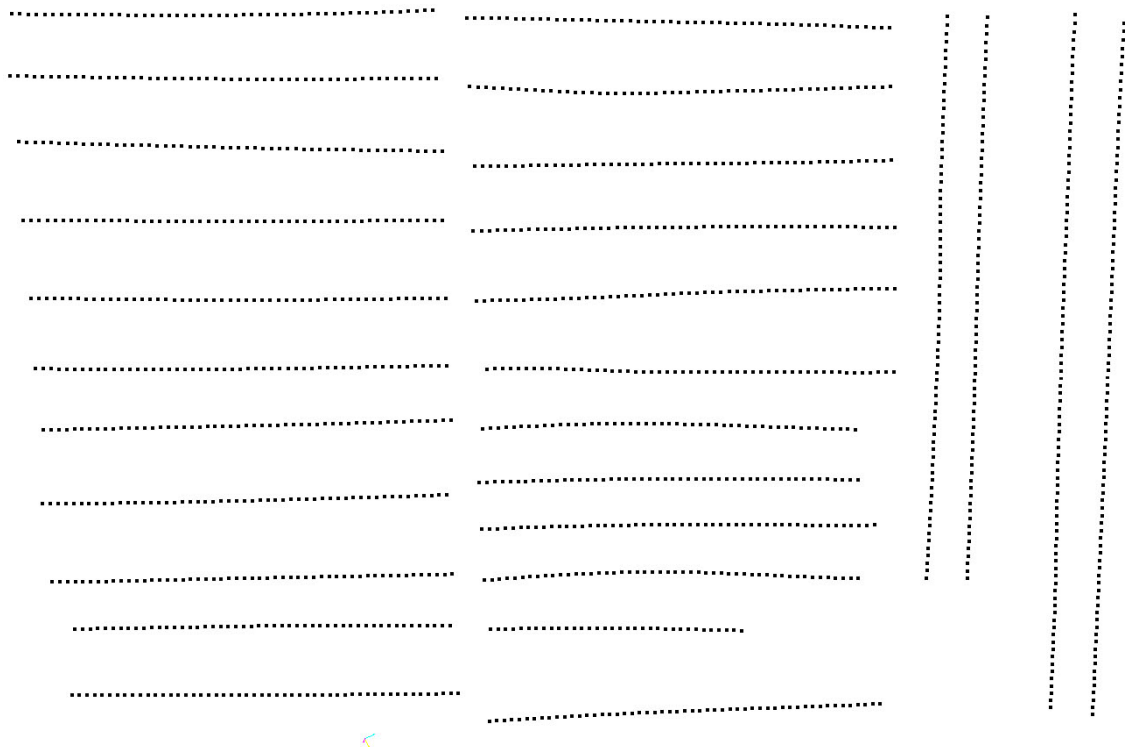
The final V-STARS point cloud for the complete object is shown below:



The final V-STARS point cloud for the main object is shown below:



The final V-STARS point cloud for the main surface is shown below:

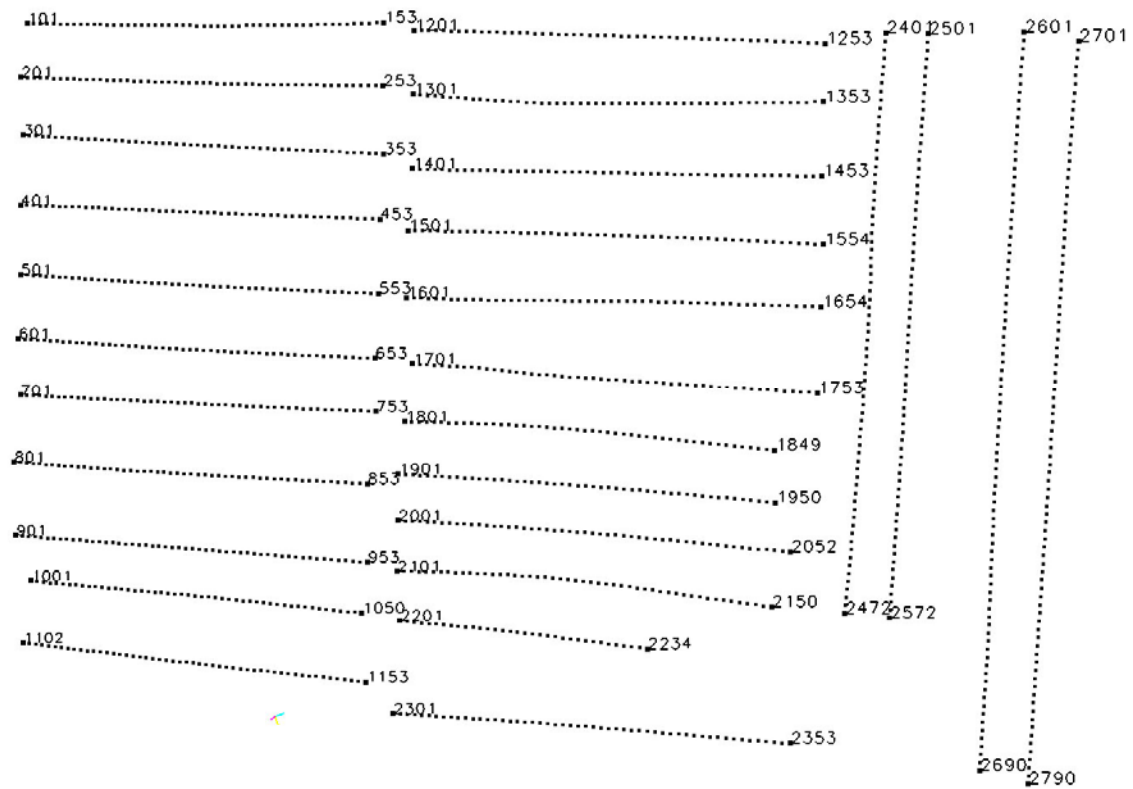


Alignment

No alignment was carried out on the data.

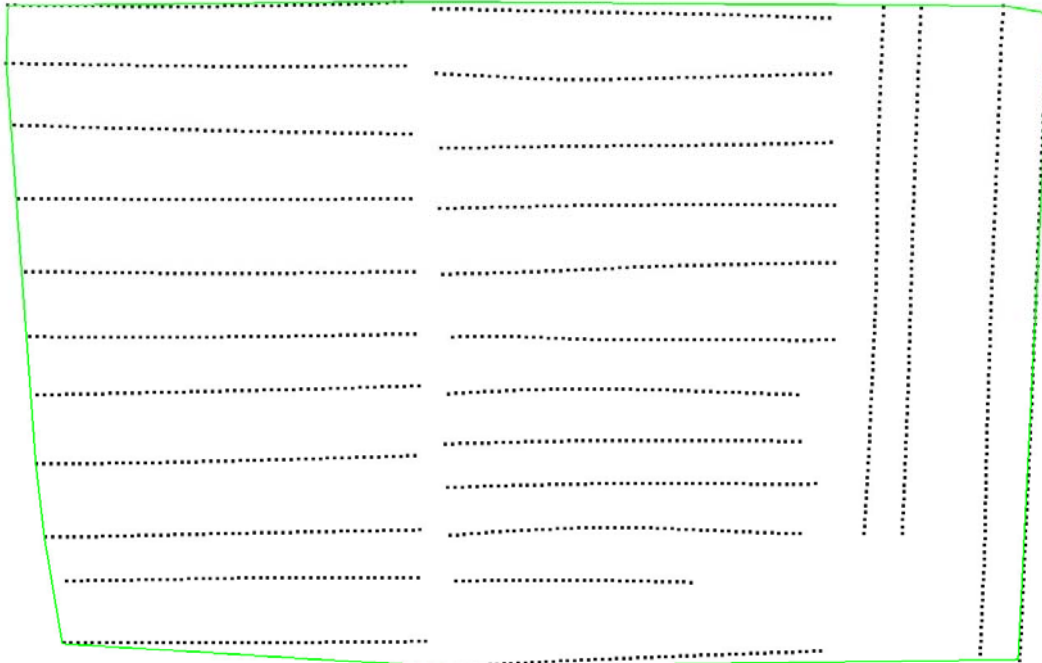
Numbering

The surface point data was renumbered to simplify analysis. The numbering scheme used is shown below.

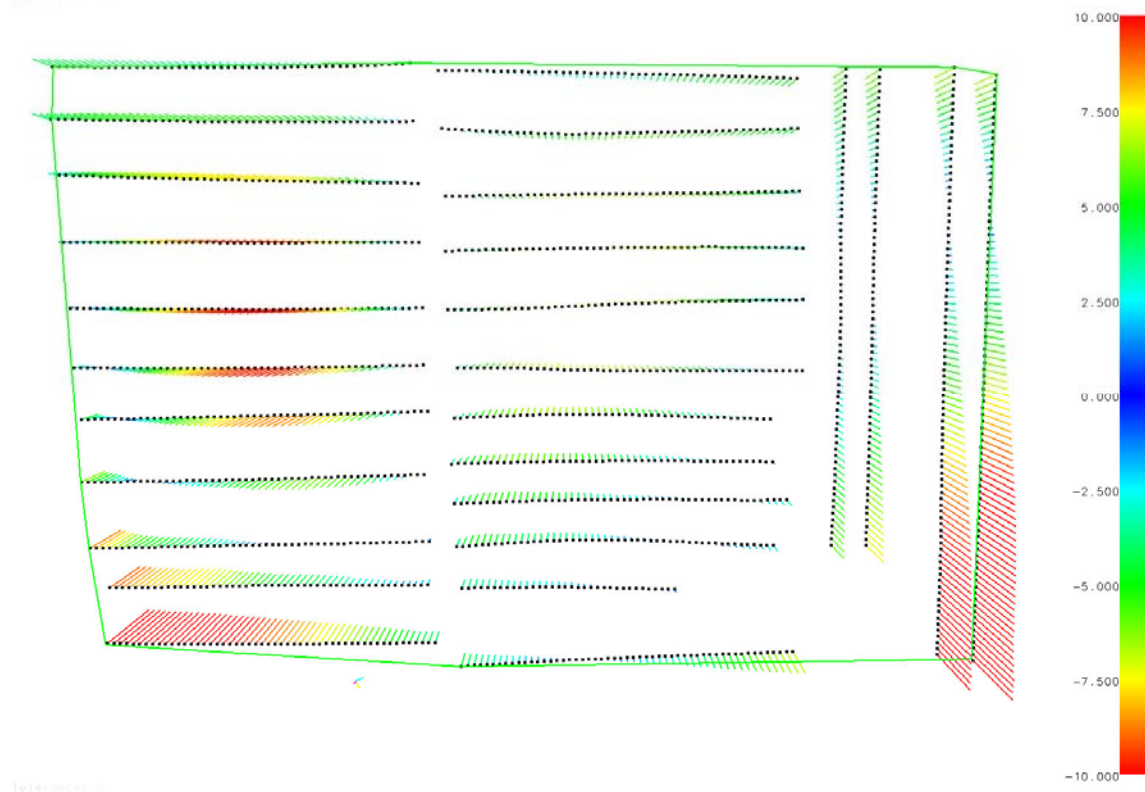


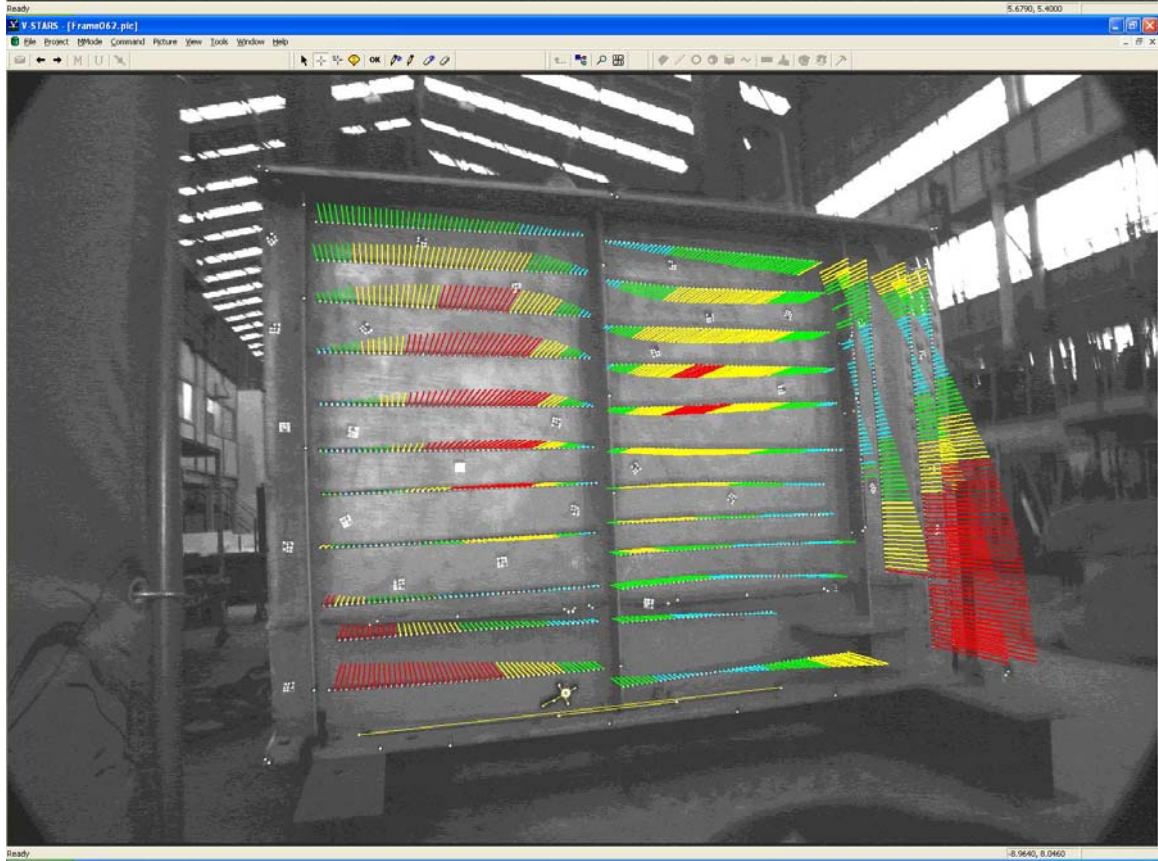
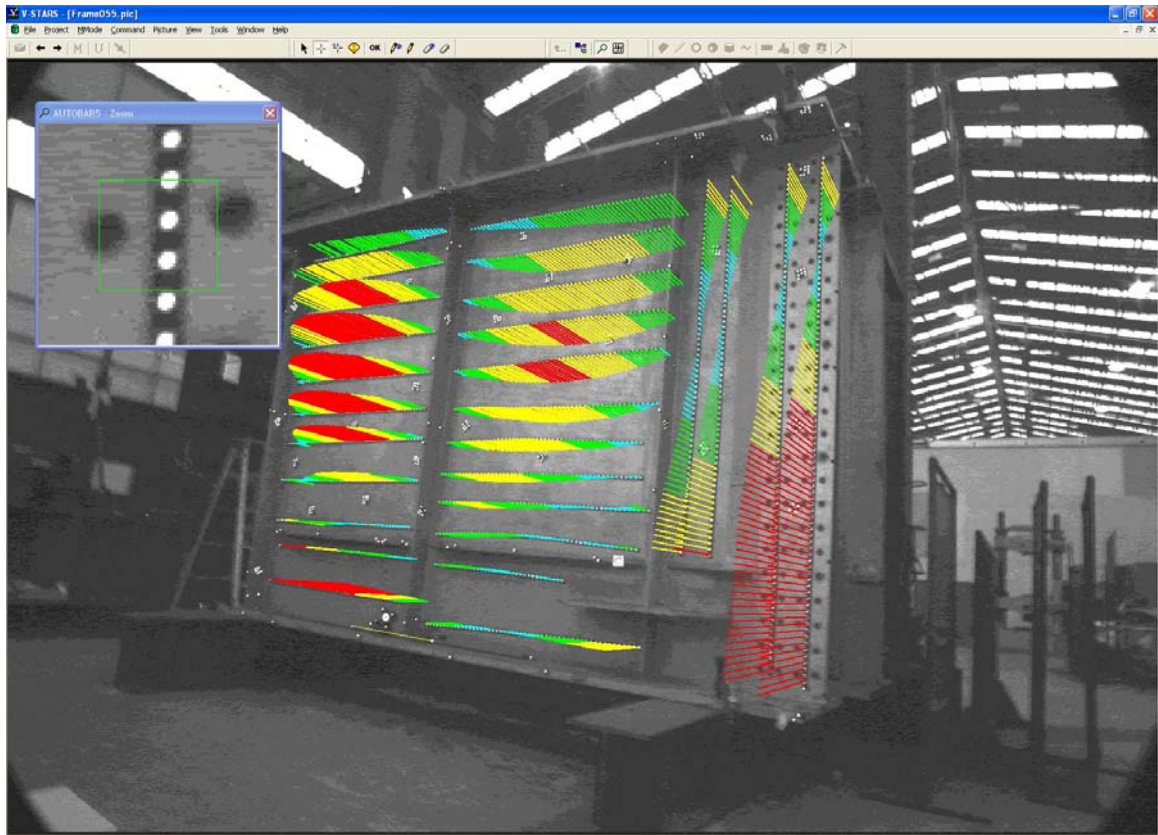
Analysis

The surface data was used to create the best fit plane. The plane had an **RMS** of **5.48mm**



The color map of the surface deviations is show in the following images.

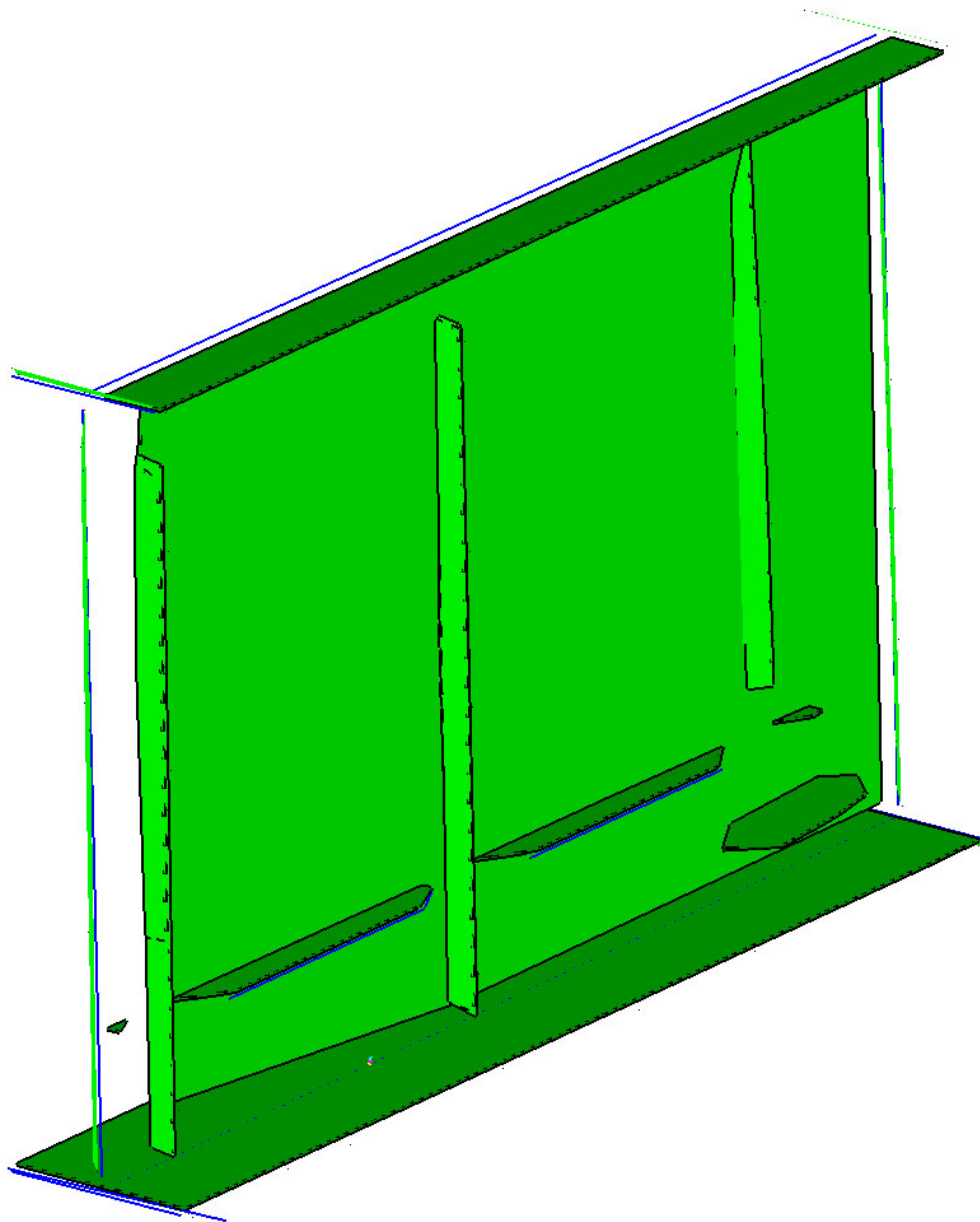




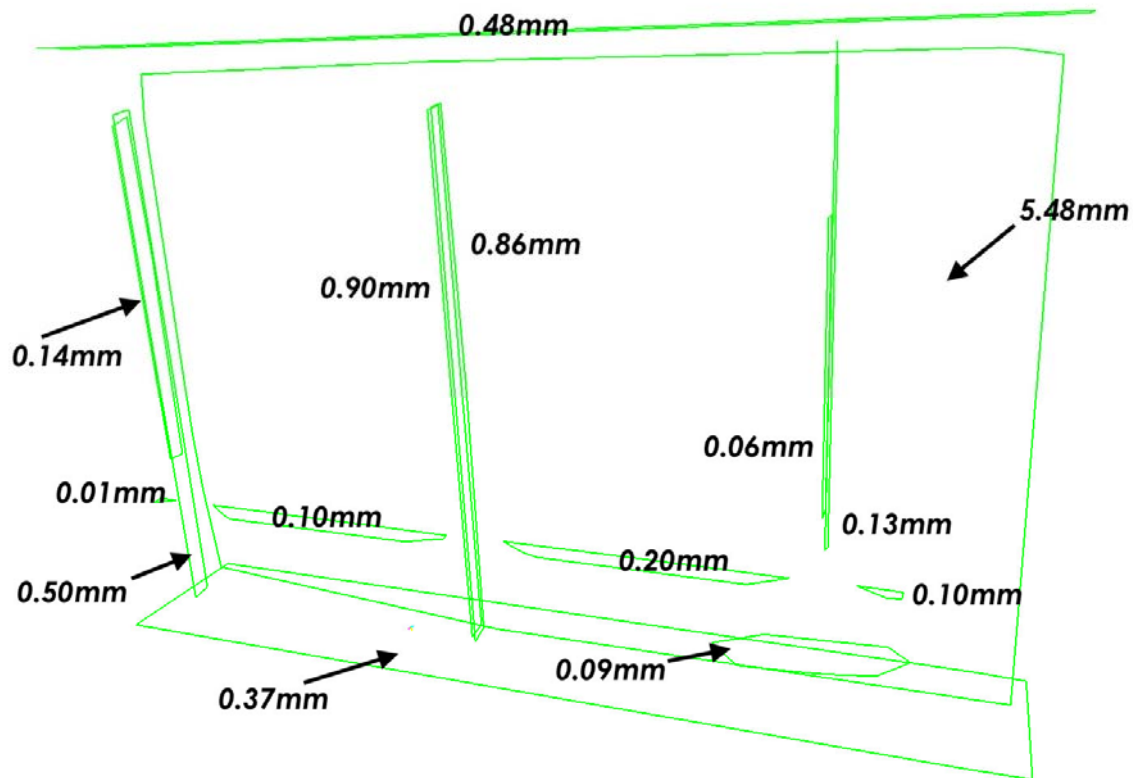
From this data a very distinctive pattern emerges. The object displays a definite twist.

The other block data was used to create key planes. These planes were used to calculate dimensions and angles of intersection where applicable.

The planes that were created are shown below.



The RMS value for the planes are displayed in the image below:



The distances calculated are as follows.

Length along bottom centerline = **3770.61mm**

Length along top centerline = **3761.03mm**

Height of left hand side (towards 101, 201) = **2488.12mm**

Height of right hand side (towards 2701) = **2526.19mm**

The planes were also used to calculate the angle between adjacent perpendicular planes. The results are as follows.

- Angle between **surface plane** and **top plane** = **89.9486°**
- Angle between **surface plane** and **bottom plane** = **89.7442°**
- Angle between **surface plane** and **left hand end plane** = **89.8574°**
- Angle between **surface plane** and **right hand end plane** = **89.8494°**

- Angle between **top plane** and **bottom plane** = **0.6227°**
- Angle between **left hand end** and **right hand end plane** = **0.0184°**

- Angle between **top plane** and **left hand end plane** = **89.0755°**
- Angle between **top plane** and **right hand end plane** = **89.0590°**

- Angle between **bottom plane** and **left hand end plane** = **89.6632°**
- Angle between **bottom plane** and **right hand end plane** = **89.6466°**

Time Summary

Initial Investigation	5 minutes
Targeting	20 minutes
Photography	5 minutes
Processing	10 minutes
Data Analysis	30 minutes
Total	60 minutes

Concluding Remarks

The measurement undertaken has shown that V-STARS with the E3X system can be a very powerful measurement tool. The results of the measurement undertaken were very accurate and more importantly were produced quickly.