



#### **RFQ Major Vane & RFQ Section Lifting**

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# Case 1 Lifting a major vane (80kg)



A lifting assembly needs to be designed and built to:

- 1. Lift an RFQ major vane from a flat surface.
- 2. Lift without obstructing the interfaces.
- 3. Allow the RFQ major vane to be rotated in a controlled manner.
- 4. Avoid damage during a lift.
- 5. Spread the load evenly.
- 6. Be inexpensive and simple to make.

The following slides represent the concept design that has evolved from conversations with Tim Smart from NAB Precision Tooling Ltd.



3 inserts per side are placed in the slots. The centre one alone has 2 x M6 caphead screws with their heads turned down to diameter 9mm. The screws constrain movement longitudinally.





The inserts should be a good fit in the slots.













Now the longitudinal bars are attached to the inserts using 3 x M8 caphead screws.















Note that there is a gap between the RFQ major vane and the end plate – because the major vanes vary in length.





Now the lifting assembly is fully constrained.





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Close up showing stub axle.







Showing the stub axle lying at the centre of gravity.







so that the straps do not foul the vane.





































And the interfaces can be seen which will help when guiding the top major vane into position.



The design has been modified to increase the span between the rails to allow the major vanes to be lifted when the alignment dowel blocks are in place.



Major RFQ Major Vane Lifting Vane 1



Now it is important to check all four different length RFQ major vanes with their different slot spacing to ensure that the lifting assembly is suitable





Major Vane 2







Major Vane 3







Major Vane 4









Check that the lifting system can be used to lower a major vane into a cradle.





# Case 2 Lifting a one metre section (210kg)



Using the same lifting assembly to lift a one metre section (210kg).







This sliced view shows the yellow plates bearing on the inner faces of the RQF slots and shows that the end plates are recessed to distribute the load from the longitudinal rods.

To insure that all of the yellow plates take their share of the load I would suggest that the 6 x M8 screws are done up finger tight and then some of the lift load is applied before we fully tighten the M8 screws.

