NCSX June 2007 ETC
TABLE IV - Uncertainty of Estimate and Residual Risk Assessment

WBS Number: 75
WBS Title: Machine Assembly Operations
Job Numbers: 7501 and 7503
Job Title: Construction Crew Support (7501)
Job Title: Machine Assembly Operations (7503)
Job Manager: Erik Perry

Uncertainty of the Estimate

		High	Medium	Low	Uncertainty Range (%)	s/Other Considerations
Job 7501					-20%/+40%	
	Design Maturity			X		Estimated without detailed drawings. Significant uncertainty that current concept will stay the same - see Residual Risks below.
	Design Complexity		X			Follows tasks in Job 7503 - but most are LOE activities
Job 7503					-20%/+40%	
	Design Maturity			X		Estimated without detailed drawings. Significant uncertainty that current concept will stay the same - see Residual Risks below.
	Design Complexity		X			Experienced in assembly fusion devices, but tolerances exceed anything done before.
	Other Comments:					Major source of uncertainty is in the machine assembly concepts which are still evolving. See Residual Risks below.

Residual Impacts

Job	Risk Description	Likelihood of Occurring	Mitigation Plan	Basis of estimate	Cost Impact Low	Cost Impact High	Schedule Impact Low	Schedule Impact High
7501 - NONE								
7503	Additional trim coils may be required to suppress field errors from n>1 modes	U	Analysis being performed to firm up requirements	Costs could more than double the present estimate	+ $200	+ $400	+ 0.00	+ 0.00
	"Back office" support for FPA and final assembly becomes a chronic bottleneck, stretching out the time required to complete assembly operations	VU	Additional support budgeted for Brown, Brooks, and Ellis providing "2 deep" back office support. Should be available to mitigate peak demands once training in key skills is completed.	Estimated impact is <2 months on the critical path. Cost impact covers up to 2 months of FPA/final assembly.	+ $0	+ $600	+ 0.00	+ 2.00

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	Insulation on TF/PF coil fails during initial cooldown and testing requiring in situ repair				**VU**	**Ist of each kind will be tested at cryogenic temperature at elevated (50% higher) voltage for faults to ground. All coils will be tested at RT at elevated (50% higher) voltage for faults to ground. Ring tests are performed to reveal low resistance turn-to-turn shorts at RT.**			**Repair in situ is assumed recovery scenario taking 2-3 months. 1 month to warmup and cooldown the stellrator core. 3 techs/1 engr for duration of active repair)1-2 months).**			**+ $50**	**+ $150**	**+ 1.00**	**+ 2.00**
	Insulation on TF/PF coil fails during initial cooldown and testing requiring dismantling stellarator core				**VU**	**Ist of each kind will be tested at cryogenic temperature at elevated (50% higher) voltage for faults to ground. All coils will be tested at RT at elevated (50% higher) voltage for faults to ground. Ring tests are performed to reveal low resistance turn-to-turn shorts at RT.**			***Crisis event not covered by contingency***						
	Insulation on modular coil fails during initial cooldown and testing requiring in situ repair				**VU**	**C1 tested at full current at cryogenic temeprature. All modular coils will be tested at RT at elevated (50% higher) voltage for faults to ground.**			**Repair in situ is assumed recovery scenario taking 2-3 months. 1 month to warmup and cooldown the stellrator core. 3 techs/1 engr for duration of active repair)1-2 months).**			**+ $50**	**+ $150**	**+ 1.00**	**+ 2.00**
	Insulation on modular coil fails during initial cooldown and testing requiring stellarator core disassembly				**VU**	**C1 tested at full current at cryogenic temeprature. All modular coils will be tested at RT at elevated (50% higher) voltage for faults to ground.**			***Crisis event not covered by contingency***						

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	Unanticipated problems with cryostat penetrations (icing, excessive condensation). May require warming up the stellarator core to effect repair with consequent impacts to critical path activities.				U	Rapid repair materials will be on hand.			Nominally repaired with a 4-man crew in 1 week with 3 weeks for warmup/cooldown (if required)			+ $15	+ $30	+ 0.25	+ 1.00
	Assembly sled for final assembly is not adequately stiff or does not provide repeatable motion				U	Functionality of sled will be determined first with concrete blocks and later with first FP. Ample time to make design modifications between arrival of the first and third FPs.			Nominal cost impact is 1 man-month of engineering design and up to half the fabrication cost of the sled			+ $25	+ $75	+ 0.00	+ 0.00
	TC floor is not adequately rigid for present metrology plan				VU	Copper sheet and spongy surface removed from TC floor. Fiducials will be placed. Concrete blocks will be placed to see if floor is adequately stiff.			Nominal cost impact is 2 man-months of engineering design and $50-150K for local reinforcement of building structures			+ $50	+ $200	+ 0.00	+ 0.00
	Modular coils are shorted across toroidal break between field periods				NC	Need very low impedence, multiple shorts to get into trouble									
	Metrology equipment and general purpose tooling/ lifting equipment (e.g.cranes) not available to support the schedule				U	Maintenance contract mitigates impact of metrology equipment. Additional $200K budgeted for a 3rd laser tracker and/or spare metrology equipment. Should result in improved efficiency.			Up to 2 week impact on FPA and critical path. FPA cost impact assumed to be $300k/mo.			+ $0	+ $150	+ 0.00	+ 0.50

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Notes:

[1]	Low cost and schedule impacts are considered the minimum (0-percentile) impacts should the event occur.
	High cost and schedule impacts are considered the maximum (100-percentile) impacts should the event occur
[2]	Cost impacts should be entered as man-hours (by demographic) and M&S direct cost under basis of estimate.
	Cost impacts should NOT include standing army costs which are separately calculated from the schedule impact
	Project control is reponsible for quantifying the low and high cost impacts based on the labor hours and M&S identified
[3]	The schedule impacts should be entered as the min and max impacts on the critical path.
	If there is no critical path impact then the schedule entries should be zero.
[4]	Likelihood of occurrence should be entered consistent with our risk classification methodology, i.e.
	VL= Very Likely (P>80%), L=Likely (80%>P>40%), U=Unlikley (40%>P>10%), VU=Very Unlikely (P<10%), NC=Non-credible (P<1%)