	Activity Name	Duration (Work Days)	Start Date	Finish Date	Predecessors	% Complete	Free Float	Resources Assigned	Comments	J	F	2 M	007 A I	M	J J
1	Bladder tests	56.00	1/15/07	4/2/07		8%									
2	Develop fill procedure for bladder. Document results of bladder testing (SS and Teflon) to date.	5.00	1/15/07	1/19/07		75%	0.00	Dudek	Documentation remains to be done.						
3	Determine if "one size fits all". Develop procurement drawings for bladder.	10.00	1/22/07	2/2/07		0%	0.00	Williamson							
4	Set up test equipment to determine CTE and stiffness and to perform cyclic testing. Procure bladders for testing.	5.00	2/5/07	2/9/07	2, 3	0%	0.00	Gettelfinger	May conflict with COF testing		•				
5	Review structural analyses to determine bladder performance requirements. Establish bladder test parameters, e.g. contact pressure.	5.00	1/22/07	1/26/07		0%	10.00	Fan		0-	-				
6	Perform tests to determine bladder properties and qualify the design for the given load conditions	5.00	2/12/07	2/16/07	4, 5	0%	5.00	Gettelfinger							
7	Procure/fab prototype bladder for C-C installation	10.00	2/5/07	2/16/07	3	0%	0.00	Dudek	Installation to be prototyped by Viola						
8	Conduct FDR of bladder design	1.00	2/26/07	2/26/07	6, 90	0%	0.00	Williamson			V				
9	Resolve FDR issues, release procurement drawings for fabrication	5.00	2/27/07	3/5/07	8	0%	0.00	Williamson							
10	Procure bladders for first FPA (2 ea)	20.00	3/6/07	4/2/07	9	0%	0.00	Dudek					,		
11	Bladders available for FPA	0.00	4/2/07	4/2/07	10	0%	34.00								
12															
13	Shims	99.00	1/2/07	5/18/07		12%				1					
14	Coefficient of friction (COF) tests	54.00	1/2/07	3/16/07		7%									
										J	F	Μ	A	M	l l

	Activity Name	Duration (Work Days)	Start Date	Finish Date	Predecessors	% Complete	Free Float	Resources Assigned	Comments	J	F	2 M	2007 A	M	J	J
15	Order candidate materials for screening tests. Perform screening tests. Pick shim surfaces.	19.00	1/2/07	1/26/07		50%	0.00	Gettelfinger								
16	Prepare standard shims for additional testing.	5.00	1/29/07	2/2/07	15	0%	0.00	Gettelfinger	"Standard" shims have a lower COF than "High COF" shims and do not require special materials to be ordered. May be moot.	•						
17	Perform additional COF tests (LN2 testing, cyclic tests, COF versus normal pressure, etc) for standard shims	5.00	2/5/07	2/9/07	16	0%	5.00	Gettelfinger								
18	Procure material for high COF shims.	15.00	1/29/07	2/16/07	15	0%	0.00	Gettlefinger								
19	Perform additional COF tests (LN2 testing, cyclic tests, COF versus normal pressure, etc) for high COF shims	10.00	2/19/07	3/2/07	17, 18	0%	0.00	Gettelfinger			×					
20	Assess implications of pressure-dependent COF for shim design	5.00	3/5/07	3/9/07	19	0%	0.00	Brooks				•				
21	Document and conduct peer review of test results.	5.00	3/12/07	3/16/07	20	0%	0.00	Gettlefinger				•				
22	Define geometry of standard shim	1.00	1/19/07	1/19/07		100%	0.00	Williamson	Done. Gary McGinnis prepared this concept for an individual shim with a surface area of ~11-in2. Special shims may be required around midplane port.							
23	Measure flanges on finished coils to determine range of shim thicknesses required.	10.00	1/22/07	2/2/07		0%	30.00	Viola	Thought to be 0.5+/-0.025". Brooks suggested 3mil increments in							
										J	F	М	А	Μ	J	J

	Activity Name	Duration (Work Days)	Start Date	Finish Date	Predecessors	% Complete	e Free Float	Resources Assigned	Comments	J	F	2 M	2007 A	М	J J
24	Add measurement of flanges to post-VPI procedure	5.00	1/22/07	1/26/07		0%	35.00	Chrzanowski							
25	Finalize procurement drawings of shim. Conduct FDR	5.00	3/19/07	3/23/07	21, 22, 23, 24	0%	0.00	Williamson			Ш				
26	Procure shims	40.00	3/26/07	5/18/07	25	0%	0.00	Dudek				1		•	
27	Shims available for FPA	0.00	5/18/07	5/18/07	26	0%	0.00								
28															
29	Tension tests of a bolted joint	90.00	1/15/07	5/18/07		6%									
30	Procure nuts, studs, and washers ASAP	90.00	1/15/07	5/18/07		14%									
31	Define reference geometry for bolted joint	5.00	1/15/07	1/19/07		100%	0.00	Williamson	Done. ORNL has provided drawings (SE140-190).						
32	Develop cost and lead time estimates for nuts, studs, and washers of different materials.	10.00	1/22/07	2/2/07	31	0%	10.00	Williamson			h				
33	Perform analyses to determine geometry and location of high COF shims and placement of new studs. Characterize performance impacts of low CTE washers.	5.00	1/22/07	1/26/07		0%	0.00	Brooks							
34	Modify reference drawings to accommodate hydraulic tensioners (and other tightening devices) and UT inspection. Document number required for each part.	10.00	2/5/07	2/16/07	33, 77	0%	0.00	Williamson		7					
35	Conduct peer review prior to procurement. Resolve issues.	5.00	2/19/07	2/23/07	32, 34	0%	0.00	Williamson							
36	Procure nuts studs and washers for start of FPA	60.00	2/26/07	5/18/07	35	0%	0.00	Dudek							
										J	F	М	А	М	JJ

	Activity Name	Duration (Work Days)	Start Date	Finish Date	Predecessors	% Complete	e Free Float	Resources Assigned	Comments	J	F	20 M)07 A	м.	l l
37	Nuts, studs, and washers available for FPA	0.00	5/18/07	5/18/07	36	0%	0.00						•	*	
38	Procure/fab parts for joint tests. Use existing parts where necessary. Machine flange surrogates from prototype casting.	20.00	1/22/07	2/16/07	31	0%	15.00	Dudek	Includes all planned development activities	•					
39	Procure tools for tightening nuts	15.00	2/5/07	2/23/07	77	0%	0.00	Dudek		-					
40	Develop design of test fixture and instrumentation	5.00	3/19/07	3/23/07	21, 34	0%	0.00	Gettelfinger	Follows friction tests. May conflict with bladder test		q				
41	Set up test fixture and equipment. Perform JHA and pre-job brief prior to proceeding.	5.00	3/26/07	3/30/07	39, 40	0%	0.00	Gettelfinger							
42	Measure joint deflection v. preload (include UT or SG measurement of bolt tension). Measure loss of preload after hydraulic pressure is removed.	3.00	4/2/07	4/4/07	41	0%	0.00	Gettlefinger				•	1		
43	Cool joint to 80K. Measure joint deflection and preload v. temperature. Test low CTE washer options.	3.00	4/5/07	4/9/07	42	0%	0.00	Gettelfinger					1		
44	Measure joint deflection and preload v. time (days) at RT and 80K	20.00	4/2/07	4/27/07	41	0%	0.00	Gettlefinger				1			
45	Measure joint deflection and preload v. cooldown cycles	3.00	4/10/07	4/12/07	43	0%	0.00	Gettlefinger							
46	Perform pullout tests for tapped holes	3.00	4/13/07	4/17/07	45	0%	0.00	Gettlefinger							
47	Document and conduct review of test results	5.00	4/30/07	5/4/07	44, 46	0%	0.00	Gettelfinger							
48															
49	Bushing tests	65.00	1/22/07	4/20/07		0%									
										J	F	М	A	M .	JJ

	Activity Name	Duration (Work Days)	Start Date	Finish Date	Predecessors	% Complete	Free Float	Resources Assigned	Comments	J	F	2 M	2007 A	7 М	J	J
50	Indentify candidate schemes for getting a bushing the fits tightly into the hole and around a stud. Prepare sketches.	5.00	1/22/07	1/26/07		0%	0.00	Williamson								
51	Measure holes on castings. Required to characterize OOT conditions.	10.00	1/22/07	2/2/07		0%	5.00	Phelps, Viola]					
52	Procure bushing materials for tests.	10.00	1/29/07	2/9/07	50	0%	0.00	Dudek								
53	Fabricate bushings.	5.00	2/12/07	2/16/07	51, 52	0%	65.00	Dudek								
54	Procure tools and materials required for bushing assembly.	15.00	1/29/07	2/16/07	50	0%	0.00	Dudek								
55	Perform trial bushing installations (short of gluing them in) on a production coil.	10.00	2/19/07	3/2/07	52, 54	0%	0.00	Viola			₹					
56	Document test results. Select bushing configuration. Conduct peer review of test results and bushing selection.	5.00	3/5/07	3/9/07	55	0%	0.00	Viola			•	•81				
57	Procure bushing materials for assembly operations. Fabricate bushings.	30.00	3/12/07	4/20/07	56	0%	0.00	Dudek								
58	Bushings available for FPA operations	0.00	4/20/07	4/20/07	57	0%	20.00									
59																
60	Shear tests of a bolted joint	25.00	3/12/07	4/13/07		0%						Y				
61	Assemble test specimens, ship to ORNL	10.00	3/12/07	3/23/07	38, 39, 56	0%	0.00	Dudek								
62	Set up test fixture at ORNL	10.00	3/12/07	3/23/07	61SS	0%	0.00	Freudenberg								
63	Measure joint deflection versus shear load. Pull to failure.	10.00	3/26/07	4/6/07	62	0%	0.00	Freudenberg								
64	Document test results. Conduct peer review of test results.	5.00	4/9/07	4/13/07	63	0%	15.00	Freudenberg								
										J	F	Μ	А	М	J	J

	Activity Name	Duration (Work Days)	Start Date	Finish Date	Predecessors	% Complete	Free Float	Resources Assigned	Comments	J	F	20 M	007 A	M	J	J
65																
66	Complete design of MC interface	80.00	1/22/07	5/11/07		0%										
	hdw	E 00	1/00/07	1/26/07		00/	80.00	For		_					—	
67	joints	5.00	1/22/07	1/20/07		0%	60.00	Fan								
68	Perform analyses to determine geometry and location of high COF shims and placement of new bolts	5.00	1/22/07	1/26/07		0%	0.00	Brooks								
69	Review structural analyses to establish performance requirements for bolted joints	5.00	1/22/07	1/26/07		0%	0.00	Brooks, Freudenberg								
70	Define reference bolted joint design	5.00	1/22/07	1/26/07		0%	0.00	Williamson								
71	Conduct PDR to review requirements, design, and development plan	3.00	1/29/07	1/31/07	15, 68, 69, 70	0%	77.00	Williamson								
72	Develop specs and drawings for Station 2 and 3 assemblies	15.00	3/26/07	4/13/07	25, 35, 56	0%	15.00	Cole								
73	Conduct MC interface FDR	0.00	5/4/07	5/4/07	47, 64, 72	0%	0.00	Williamson								
74	Resolve issues, release assembly spec and drawings	5.00	5/7/07	5/11/07	73	0%	5.00	Williamson					•	1		
75																
76	Perform assembly trials. Procure tools and tooling.	70.00	1/22/07	4/27/07		0%										
77	Choose tools for tightening nuts. Define features needed to tighten nut (including measuring preload). Determine which holes have adequate space to tighten nuts using templates. Repeat for special cases where inadequate space exits. Tabulate results.	10.00	1/22/07	2/2/07	31, 33FF+5.00	0%	0.00	Viola	Iterative process		1					
										J	F	Μ	A	M	J,	J

	Activity Name	Duration (Work	Start Date	Finish Date	Predecessors	% Complete	Free Float	Resources Assigned	Comments	J	F	2 M	007 A	M	L L
78	Survey each coil type using templates. Determine stud length constraints based on access limitations for torquing/tensioning.	10.00	2/5/07	2/16/07	77	0%	65.00	Viola							
79	Identify areas that need to be measured in post-VPI and ground	25.00	1/22/07	2/23/07		0%				•					
80	Identify "close points" when assembling	5.00	1/22/07	1/26/07		0%	15.00	Brown							
81	Perform fits of C-C, C-B, B-A, and A-A	20.00	1/22/07	2/16/07		0%	0.00	Viola							
82	Provide guidance to revise post-VPI procedure to include measurement points	5.00	2/19/07	2/23/07	80, 81	0%	60.00	Brown							
83	Perform trial x-y-z alignments on C1-C2. Demonstrate capability to satisfy alignment requirements with individual shims of uniform thickness.	10.00	1/22/07	2/2/07		0%	0.00	Viola							
84	Establish alignment mechanisms, metrology equipment complement and positioning requirements, etc. Conduct peer review.	5.00	2/5/07	2/9/07	83	0%	0.00	Viola			•				
85	Procure alignment mechanisms, fiducials, lifting equipment, etc. for assembly operations	40.00	2/12/07	4/6/07	84	0%	15.00	Dudek			•				
86	Develop procedures for torquing bolts	5.00	2/26/07	3/2/07	39, 83	0%	0.00	Viola							
87	Determine fiducial types and locations	10.00	3/5/07	3/16/07	86	0%	0.00	Viola							
88	Procure monuments and related metrology equipment	30.00	3/19/07	4/27/07	87	0%	0.00	Dudek							
89	Tools and tooling available for FPA operations	0.00	4/27/07	4/27/07	39, 85, 88	0%	15.00						×		
90	Prototype bladder installation.	5.00	2/19/07	2/23/07	7	0%	0.00	Viola		T					
										J	F	М	А	Μ	JJ

	Activity Name	Duration	Start	Finish	Prodocossors	% Complete	Free	Resources	Commonts			2	2007	7		
		Days)	Date	Date	Fieuecessois		Float	Assigned	Comments	J	F	М	А	Μ	J	J
91																
92	Finalize preparations for assembly operations	20.00	4/18/07	5/15/07		0%										
93	Document assembly sequence	5.00	4/18/07	4/24/07	8, 25, 46, 56	0%	0.00	Brown								
94	Finalize dimensional control plan	5.00	4/25/07	5/1/07	93	0%	0.00	Ellis								
95	Finalize assembly procedure	5.00	5/2/07	5/8/07	94	0%	0.00	Viola					•			
96	Establish back office support requirements and data flow	5.00	5/9/07	5/15/07	95	0%	0.00	Viola						•		
97	Train technicians in operation of the metrology equipment and measurement procedures	5.00	5/9/07	5/15/07	95	0%	0.00	Viola						•		
98	RLM authorization for assembly operations	0.00	5/15/07	5/15/07	96, 97	0%	3.00	Dudek								
99																
100	Start Station 2 assembly operations	0.00	5/18/07	5/18/07	11, 27, 37, 58, 73, 89	0%	0.00	Viola					ľ			
										J	F	М	А	М	J	J