

Appendix 1.

System Level

1.1 Complete Component List and Budget

2.2 Requirements Verification Availabilities

reel.SMRT
Mid- Term Review
16 August 2009



reel.SMRT Budget Summary at MTR

TOTAL RRP of PROJECT COMPONENTS			EURO	9381
Discounts (approx.)	CYPRES Unit	1	1200	1200
	Parachute	1	120	120
	Line	1	50	50
	Swivels	3	5	15
	IMU	1	400	400
	Reel	1	400	400
TOTAL BUDGET FOR TEAM TO COVER:				7195
Monetary Support	ESA	1	3000	3000
	GCS	1	300	300
	RUAG Aerospace Austria GmbH	1	800	800
	Sylvia Meinhart	1	150	150
	Mark Fittock	1	300	300
	LTU	1	500	500
TOTAL BUDGET AFTER SPONSORSHIP:				2145
Resulting Contribution of Team Members (per member contribution)		8		270

reel.SMRT Component List and Detailed Budget Tables at MTR

Component	Description	Qty	Cost per Item (EUR)	Total Cost (EUR)	Manufacturer	Part No.	Status
MECHANICAL							
<i>Mechanical: MAIN Payload</i>							
PU25	Universal Aluminium Profiles, sold in 3000mm length	2	28.16	56.32	Solectro	2000013000	Received
Slide Nut M6	Slide nut made for the PU25 profiles, 20 for 135 SEK and 100 for 305 SEK, at least 38 are needed	2	12.26	24.52	Solectro	2090010005	1 Received, 1 Maybe To Be Ordered
M2 8mm Socket Cap Screw	At least 20 are needed	1			Verktgshuset Kiruna	N/A	To Be Purchased
M2 Nut	At least 12 are needed	1			Verktgshuset Kiruna	N/A	To Be Purchased
M4 20mm Button Head Screw	At least 3 are needed	1			Verktgshuset Kiruna	N/A	To Be Purchased
M6 20mm Flat Head Screw	At least 14 are needed	1	6.22	6.22	Verktgshuset Kiruna	N/A	Received
M6 12mm Flat Head Screw	At least 5 are needed	1				N/A	Received
M6 45mm Flat Head Screw	At least 4 are needed	1	2	2	Verktgshuset Kiruna	N/A	Received
M6 20mm Button Head Screw	At least 38 are needed	1	5.47	5.47	Würth Svenska AB Kiruna	N/A	Received
M6 10mm Button Head Screw	At least 24 are needed	1	4	4	Verktgshuset Kiruna	N/A	Received
M6 10mm Flat Head Screw	At least 4 are needed	1	0	0			To Be Purchased
M5 30mm Flat Head Screw	At least 11 are needed	1	4	4	Verktgshuset Kiruna	N/A	Received
M5 Nut	At least 3 are needed	1	0	0			To Be Purchased
M6 Washer	4mm thick M6 washer, at least 4 are needed	1	2	2	Verktgshuset Kiruna	N/A	Received
Flanged Sleeve Bearing	Bearing to support the second lever of the bail release	1	10	10	McMaster	7751K72	To Be Ordered

Torsion Spring	Spring to return the second lever of the bail release	1	4	4	McMaster	9287K147	To Be Ordered
Angle Adaptor	Piece to join the profiles at an angle; 500 N max load Hinge 6 30x30, heavy-duty	8	24			0.0.419.80	Received
Mount Bracket	Custom corner bracket to mount the MAIN on the gondola Angle Bracket 6 30x30 Zn, white aluminium, similar to RAL 9006	4	4.5	284.71	Item http://www.item.info/en Distributors: Aluflexsystem AB Total Cost: 3015 SEK	0.0.419.63	Received
Spare Mount Brackets	Sold in packs of 4	1	1.41	1.41	Trä och Bygg i Kiruna AB		Received
Rigid Shaft Coupler	Rigid steel parallel shaft coupler for 12mm to 12mm keyed shafts	2	60	120	Michaud Chailly	a5-28-12-12-1	Ordered
Machined Keys	4mm x 4mm x 16mm keys	1	6	6	McMaster	96717A140	To Be Ordered
Line Guide Bearing	Sleeve bearings used to support the Line Guide Assembly Pdyn = 16.6 kN; Pstat = 52 kN	2	7	14	Michaud Chailly	C3-151-14-16-15	Received
Spinning Reel	Daiwa Saltiga Surf Spinning Reel 6000	1	664.1	664.1	Daiwa (Australian Distributer)	Saltiga Surf 6000	Received
Servo Motor	Robotis Dynamixel AX-12+, 12V serial network servo	2	62.95	125.9	Robotis	AX-12+	Received
Brushless Motor	EC 45 flat Ø45 mm, brushless, 50 Watt, with Hall sensors Planetary Gearhead GP 42 C Ø42 mm, 3 - 15 Nm, Ceramic Version	2	265	530	Maxon	251601 203119	Received

Linear Actuator	40 N, 30 mm, 12 V, Analog Package Content: L12-30-210-12-P, 4x M4 15mm Button Head Screws, 4x M4 Self-lock Nuts, 2x Mount Clamps, 2x Mounting Clevis, 1x Plastic Thing	1	72.06	72.06	Firgelli	L12-30-210-12-P	Received
Safety Brake	8 Nm, 30mm thick, 97mm diam., power-off brake, 24V, 15W	1	214	214	Ogura	RNB-0.8G	Ordered
Insulation	Insulation for both the MAIN and FISH 50mm thick	6	3.8	23	Tra & Bygg	N/A	Received
Metal Pipe Ring	To hold on Reel to structure	2	1.2	2.4	Verktgshuset	N/A	Received
Total Mechanical MAIN Payload (EUR)							2176
Mechanical: FISH							
Aluminium Sheet	0.5 mm thickness	1	15	15	LTU	N/A	Received
Aluminium Sheet	1 mm thickness	1	0	0	LTU	N/A	Received
Aluminium Sheet	1.5 mm thickness	1	0	0	LTU	N/A	Received
Parachord	500 lb strength chord, 200 m	1	5	10	Trueways Survival School	N/A	Received
Parachute	160 mm diameter, storgage 50mm	1	0	0	Estrange	N/A	Received
Battery Holder	C type, 2 large cells 60mm x 60mm	1	5	5	Farnell	BH221B	Ordered
CYPRES Unit	Parachute release mechanism	1	0	0	Estrange	N/A	Received
Aluminium Strip	20mm x 3 mm	2	10	20	Stålcenter i Norr AB	N/A	Received
Insulation	50mm thickness	1	0	0	Kiruna Trä och Bygg	N/A	Received
M4 screws	20mm	20	0.05	1	Verktgshuset	N/A	Received
M4 nuts		20	0.05	1	Verktgshuset	N/A	Received
M4 washer		20	0.05	1	Verktgshuset	N/A	Received
M5 Screws	20mm	20	0.05	1	Verktgshuset	N/A	Received
M5 washers		20	0.05	1	Verktgshuset	N/A	Received
M5 nuts		20	0.05	1	Verktgshuset	N/A	Received
M4 Screw Button head	20 mm long	6	5	30	Kiruna Harware Store	N/A	Received
M4 nut Nylon nuts		6	4	24	Kiruna Harware Store	N/A	Received

M5 washer		6	3	18	Kiruna Harware Store	N/A	Received
M4 Rivit	6 mm head, 5 mm length	10	0	0	University	N/A	Received
Epoxy		1	7.5	7.5	Coop	N/A	Received
Cable ties	200 mm long	4	0	0	TBC	N/A	Received
Superbraid Line	150 Lb strength , 300 m line	1	50	50	Diawa	N/A	Received
Swivel	30 mm swivel, high stength	2	10	20	Diawa	N/A	Received
Base Layer Paint	Base Paint to colour the the FISH	1	9.4	9.4	Posten Meddelande	N/A	Received
PVC Pipe	Alternate Skin	1	15	15	WS Companiet	N/A	Received
Insulation Glue	Glue for the insulation	1	4.6	4.6	Tra & Bygg	N/A	Received
Total FISH (EUR)							234
TOTAL MECHANICAL COSTS (EUR)							2410

Component	Description	Qty	Cost per Item (EUR)	Total Cost (EUR)	Manufacturer	Part No.	Status
MANAGEMENT & OUTREACH							
Stickers	reelSMRT Stickers	1	35	35	Svenska WIP	N/A	Received
Stickers (2nd Batch)	reelSMRT Stickers with webpage	1	60	60	Svenska WIP	N/A	To be Ordered
Outreach Payload Printing Materials	Printing of Letters for Sponsors to fly on Balloon	1	0	0	DLR	N/A	Confirmed
Outreach Competition Shipping	Shipping of Prizewinners's payload	8	20	160	Coop	N/A	To Be Confirmed
Outreach Sticker Printing	Sticker to print and attach to the FISH	1	30	30	Svenska WIP	N/A	To Be Confirmed
Patches	reelSMRT Patches for Outreach Payload	100	2	130	Patch Super Store	N/A	Confirmed
Sponsor Board Printing	Printing of a large sign for promotional material photos	1	0	0	DLR	N/A	Confirmed
Printing	Printing SED	9	0	0	Kjell Lundin	N/A	Confirmed
Travel to Selection Workshop	Non-EU member travel to selection workshop	2	175	350	Misc	N/A	Confirmed
Sponsorship Thankyou Package Materials		15	10	150	Coop	N/A	
Sponsorship Thankyou Package Shipping	Shipping for miscellaneous items ie. To Sponsors	1	50	50	Coop	N/A	To Be Confirmed
TOTAL OUTREACH COSTS (EUR)							965

Component	Description	Qty	Cost per Item (EUR)	Total Cost (EUR)	Manufacturer	Part No.	Status
SOFTWARE							
Evaluation Board	Evaluationboard for the Microcontroller NXP lpc2368	1	162	200	KEIL	KEIL MCB2360	Received
Evaluation Board	Second Evaluationboard to test FISH and MAIN Payload setup	1	56	56	steitec.de	ETT CP-JR ARM7 LPC2368	Received
RF Modules	Evaluation set consisting of two RF modules	1	180	220	digi.com	xBee Pro 868 (XBP08-DK)	Received
RF Modules (testing)	RF modules used during testing	2	19	38	digi.com	xBee (XB24-DMWIT-250)	Received
IP Camera	CCD camera to observe reel mechanics and to monitor FISH during flight	1	175	175	lupus-electronics.de	Lupus LUPUSNET LE185	To Be Ordered
SD Card	Data storage cards	2	6	12	Transcend	Transcend TS2GSDC	Received
USB to Serial converter cable	USB to Serial converter to program microcontrollers and interface servos	1	12	12	kmelektronik.de	Digitus	Received
TOTAL SOFTWARE COSTS (EUR)							713

Component	Description	Qty	Cost per Item (EUR)	Total Cost (EUR)	Manufacturer	Part No.	Status
ELECTRONICS							
<i>Electronics: FISH</i>							
Accelerometer ASC 5421	Precise accelerometer,10mg bias,40Hz bandwidth	1	1147	1032.3	ASC GmbH	ASC 5421-002-1A	Ordered -10% discount
LIS3L02AQ3	Medium-g, 3 axis, high bandwidth	2	15.75	38.43	ST	LIS3L02AQ3	Received
ADC1278	Precise,wide bandwidth converter,sync mode	2	52.1	127.124	Texas Instruments	ADC1278	Received
batteries	saft	6	10	60	SAFT	LS14250	To be Ordered
LPC2368FBD100	Microcontroller	2	11.68	37.6492	Philips	lpc2368	Ordered but delayed
memory mount	microSD	2	3.19	7.7836	Molex	N/A	Received
memory	microSD 1GB - 2GB	2	10	20	Sandisk	N/A	To be ordered
Capacitor	22pF, Ceramic, 0805, 50V	20	0.036	0.8784	PHYCOMP(YAGUEO)	N/A	Received
Capacitor	1uF, ceramic, 0805, 25V	22	0.38	10.1992	KEMET	N/A	Received
Capacitor	10uF, ceramic, 0805, 6.3V	5	0.77	4.697	AVX	N/A	Received
Capacitor	0.1uF, Ceramic, 0805, 100V	12	0.142	2.07888	KEMET	N/A	Received
Resistor	10Kohm,0805, 0.125W, 150V	50	0.061	3.721	Yageo	N/A	Received
LP38691DT-1.8	1.8V Regulator	3	0.92	3.3672	National Semiconductor	LP38691DT-1.8	Received
LP38691DT-3.3	3.3V Regulator	3	1.17	4.2822	National Semiconductor	LP38691DT-3.3	Received
LP38691DT-5.0	5.0V Regulator	3	1.59	5.8194	National Semiconductor	LP38691DT-5.0	Received
PCB Manufacture	4-layer PCB	3	52	260	Kamitra	PCB 4-layer +83 Euro tooling	Ordered
Header 1 row 6 Way	Header for PCB	10	0.27	3.294	Harwin		Received
Header 2 row 10 way	Header for PCB	10	1.15	14.03	Harwin		Received
Header 1 row 4 way	Header for PCB	10	0.35	4.27	Harwin		Received
Header 1 row 10 way	Header for PCB	10	0.84	10.248	Harwin		Received
Header 1 row 5 way	Header for PCB	6	0.7	5.124	Harwin		Received
Header socket 50 pol SMD	Header for PCB	1	13.22	16.1284	Fischer Elektronik		Received
Resistor	100 ohm, 0805	20	0.26	6.344	KOA		Received

Switch	Tactile PCB switch	5	0.35	2.135	ALPS		Received
Crystal	12 Mhz	2	2.74	6.6856	IQD		Received
Crystal	32.768 khz	5	0.144	0.8784	ABRACON		Received
Header 1 row 2 way	Header for PCB	10	0.198	2.4156	Harwin		Received
ADR445 B grade	Precise 5V reference,2mV max error,10mA source	2	10.09	24.6196	Vin Max 18V	ADR445 B grade	Received
Total FISH (EUR)							1715
Electrical: MAIN Payload							
MURATA POWER SOLUTIONS - NPH10S2405EIC - CONVERTER, DC/DC, 10W, 5.1V	dc/dc converter	2	39	78	farnell se	1175755	Received
IMU	Wolfenbuttel University	1	0	0	Wolfenbuttel University	custom	Received (no cost)
HIRSCHMANN ,GDM 3016 schwarz/black	connector	12	1.9	22.8	farnell se	1326451	Ordered
HIRSCHMANN,GSA3000	connector	12	1.9	22.8	farnell se	1326451	Ordered
LPC2368FBD100	microcontroller	1	9.4	9.4	farnell se	1524645	Received
LITTELFUSE 354 900	fuse holder	10	1.1	11	farnell se	1453898	Ordered
iR 4OCTQ045PbF	power rectifier	20	0.7	14	farnell se	1625132	Ordered
POWER-CHOKE WE-HCFT	inductor	10	4.9	49	farnell se	1636256	Ordered
COMMON MODE CHOKE WE-CMB	inductor	4	4.9	19.6	farnell se	1636292	Ordered
CAPACITOR, CLASS X2, 0.01UF, 275V	capacitor,ac	2	2.7	5.4	farnell se	1695301	Ordered
Vishay Bcomponents, ELECTROLYTIC	electrolytical capacitor	2	2.7	5.4	farnell se	1695301	Received
ceramic, X7R Dielectric	various values	20	2.7	54	farnell se	1657944	Received
0805,resistor	resistors,varios values	40	0.9	36	farnell se	1501925	Received
on semiconductor mc7806ctg	linear 6V regultor	4	0.4	1.6	farnell se	1468763	To be ordered
TSR 1-2465	dc/dc 6.5V converter	4	8.5	34	farnell se	1696321	Received
st,LD1117A	linear adjustable regulator	2	1.3	2.6	farnell se	1087163	Received
ITT CANNON - ZDC37P	cannon dsub,connector,9 pin	10	1.4	14	farnell se	1348015	Ordered
TMR 2422	dc/dc 24/+ -12,2W	4	11	44	farnell se	8205914	Ordered

heatsink	various types	10	1.9	19	farnell se	4621300	Ordered
BURR-BROWN, ISO124	isolated amplifier	1	17	17	farnell se	1212426	Received
MAX4051AESE+	analog multiplexer	1	5.4	5.4	farnell se	1379961	Received
Zigbee	communicatio module	2	0	0	farnell se	1546390	Received
A1201ELHLT-T	hall sensor	4	1.5	6	farnell se	1521674	Received
MAX3232CDE4	rs-232 driver	1	2.8	2.8	farnell se	1287437	Ordered
MCP9800	temperature sensor	4	1.4	5.6	farnell se	1439485	Received
CRYSTAL, THT	oscilator	2	1.3	2.6	farnell se	1640870	Ordered
REF5025	voltage reference	1	5.4	5.4	farnell se	1439622	Ordered
AD712JNZ	operation amplifier	2	5.9	11.8	farnell se	9604898	Received
Vishay, ILQ5	optcoupler	4	2	8	farnell se	1469481	Received
GP2D120XJ00F	proximity sensor	3	18.5	55.5	farnell se	9707859	To be ordered
High Power Polymer Li-Ion Pack: 22.2v 2200mAh	battery	5	70	650	batteryspace	PLH- 803496HD- 6S-WR	To be ordered
PCB	1dm2,poolservis	10	18	180	PragoBoard		Received
TOTAL MAIN Payload (EUR)							1393
TOTAL ELECTRICAL COSTS (EUR)							3107
TOTAL COSTS OF COMPONENTS (NOT INCLUDING THOSE FREE OR BORROWED)							7915

Requirements Verification Table at MTR

Req. ID #	Test ID #	Test Title	Test Model	Verified by Design (YES/NO)	Verified by test (PASS/FAIL/ NYT)	Responsible Member
Mission Level Requirements						
Req.F.1	Req. Verification	Req.F.M.1, Req.F.M.11, Req.O.E.7, Req.O.M.2, Req.O.M.3, Req.O.M.4	NA	YES	NYT	Katherine
Req.F.2	Req. Verification	Req.F.M.1, Req.F.M.2, Req.FM.3	NA	YES	PASS	Katherine
Req.F.3	Req. Verification	Req F.M.1, Req.F.M.2, Req.F.M.3, Req.F.E.10	NA	YES	NYT	Katherine
Req.F.4	Req. Verification	Req.F.E.3, Req.F.E.4, Req.F.E.5, Req.F.E.6, Req.F.E.7, Req.F.E.11, Req.F.E.12, Req.F.E.14, Req.F.E.15	NA	YES	NYT	Katherine
Req.F.5	Req. Verification	Req.F.M.7, Req.F.M.8	FM	YES	NYT	Katherine
Req.F.6	Req. Verification	Req.F.M.9	FM	YES	NYT	Katherine
Req.F.7	Req. Verification	Req.O.M.1				Katherine
Req.F.8	Req. Verification	Req.F.S.1, Req.F.S.4				Katherine
Req.F.9		Scientific Justification and Simulation - CDR	SIM	YES	PASS	Katherine
Req.F.10		Simulation - PDR	SIM	YES	PASS	Katherine
Req.F.11		Outreach plan - CDR	NA	YES	PASS	Fitts, Katherine
Req.F.12		Accelerometer Quality	NA	YES	NYT	Katherine
Req.F.13		Mass Calculation - CDR	FM	YES	NYT	Katherine
Req.T.1	M.17	Reel Functionality Test & Req.F.M.1	FM	YES	NYT	Katherine
Req.T.2	Req. Verification	Req.O.E.1, Req.O.E.3, Req.O.E.4	FM	YES	NYT	Katherine
Req.O.1	Req. Verification	Req.O.E.7 - Accelerometer selection, calibration & test.	FM	YES	NYT	Katherine
Req.O.2		Risk Analysis	NA	YES	PASS	Katherine
Req.O.3		Design - CDR	FM	YES	NYT	Katherine
Req.O.4	Req. Verification	Req F.M.1, Req.F.M.2, Req.F.M.3, Req.F.E.10, Req.O.E.6	FM	YES	NYT	Katherine
Req.O.5	Req. Verification	Req.F.E.3, Req.F.E.4, Req.F.E.5, Req.F.E.6, Req.F.E.7, Req.F.E.11, Req.F.E.12, Req.F.E.14, Req.F.E.15	FM, EB	YES	NYT	Katherine
Req.O.6	Req. Verification	Req.F.S.1, Req.F.S.3	FM	YES	NYT	Katherine
Req.O.7	Req. Verification	Req.F.S.3, Req.T.M.1, Req.T.M.2, Req.O.E.1,				Katherine
Req.O.8	Req. Verification	Req.F.M.10, Req.O.E.4	NA	YES	NYT	Katherine
Req.O.9		Response to Review Recommendations, Submissions	NA	YES	YES	Katherine
Req.O.10		NA				Katherine
Req.O.11		Budget Calculations - CDR		YES	YES	Katherine
Req.O.12		Accelerometer Quality	NA			Katherine

Req. ID #	Test ID #	Test Title	Test Model	Verified by Design (YES/NO)	Verified by test (PASS/FAIL/ NYT)	Responsible Member
Mechanical Subsystem Requirements						
Req.F.M.1	M.15, M.16, M.17	Reel Functionality Test	FM	YES	NYT	Campbell, Mikael
Req.F.M.2	M.6	Brake Strength Test	FM	N/A	NYT	Mikael
Req.F.M.3	M.15, M.16, M.17	Reel Functionality Test	FM	N/A	NYT	Campbell, Mikael
Req.F.M.4	M.19, M.22	FISH Aerodynamic Stability Test	FM	YES	NYT	Campbell
Req.F.M.5		Friction Calculation - CDR	FM	YES	PASS	Mikael
Req.F.M.6		Simulation Calculation - PDR		YES	PASS	Waen
Req.F.M.7		Mass Calculation - CDR	FM	YES	PASS	Campbell
Req.F.M.8		Mass Calculation - CDR	FM	YES	PASS	Mikael
Req.F.M.9		Length Calculation - CDR	FM	YES	PASS	Campbell
Req.F.M.10	M.15, M.16, M.17	Reel Functionality Test	FM	YES	NYT	Campbell, Mikael
Req.F.M.11	M.19, M.22	FISH Aerodynamic Stability Test	FM	YES	NYT	Campbell
Req.T.M.1	M.21 and M.17	Thermal Test	FM	YES	NYT	Campbell, Mikael
Req.T.M.2	M.15, M.16, M.17	Reel Functionality Test	FM	YES	NYT	Campbell, Mikael
Req.T.M.3		Budget		N/A	PASS	Campbell, Mikael
Req.T.M.4	M.15, M.16, M.17	Reel Functionality Test	FM	YES	NYT	Campbell, Mikael
Req.O.M.1		Length measurement	FM	YES	PASS	Campbell, Mikael
Req.O.M.2	M.22	FISH Aerodynamic Stability Test	FM	YES	NYT	Campbell
Req.O.M.3	M.15,M.16,M.17	Reel Functionality Test	FM	YES	NYT	Campbell, Mikael
Req.O.M.4	M.19, M.22	FISH Aerodynamic Stability Test	FM	YES	NYT	Campbell
Software Subsystem Requirements						
Req.F.S.1	S.4, S.6, S.10	Control the experiment	EM	YES	NYT	Jan, Waen
Req.F.S.2		Store sensor data	EM	YES	PASS	Jan
Req.F.S.3	S.13, S.14	Guarantee Emergency procedures	EM	YES	NYT	Jan
Req.F.S.4	S.8, S.9, S.10	Downlink sensor data	EM	YES	NYT	Waen
Req.T.S.1	S.4, S.6	Real Time Operating System	EM	YES	NYT	Jan, Waen
Req.T.S.2		cost budget	EM	N/A	PASS	Jan, Waen
Req.O.S.1	S.4, S.5	Control Actuators	EM	YES	NYT	Jan, Waen
Req.O.S.2	S.15	Watchdog (Power-On-Reset)	EM	YES	NYT	Jan
Req.O.S.3	S.13, S.14, S.10,S.11	Contingency Procedures	EM	YES	NYT	Jan

Req. ID #	Test ID #	Test Title	Test Model	Verified by Design (YES/NO)	Verified by test (PASS/FAIL/ NYT)	Responsible Member
Electrical Subsystem Requirements						
Req.F.E.6, Req.F.E.9, Req.F.E.15, Req.T.E.7 Req.F.E.1, Req.T.E.1 , Req.T.E.2, Req.T.E.3 , Req.T.E.4m, Req.O.E.2 Req.F.E.10 , Req.F.E.11 , Req.O.E.6 Req.F.E.12 , Req.O.E.1 , Req.O.E.3	E.1	Subsystem Basic	FISH FM, MAIN FM	YES	NYT	David/Mikulas
Req.O.E.4 Req.O.E.4 Req.O.E.4 Req.F.E.1, Req.T.E.1 , Req.T.E.2, Req.T.E.3 , Req.T.E.4	E.2	Sensor Basic	FISH FM, MAIN FM	YES	NYT	David/Mikulas
Req.F.E.4, Req.T.E.6	E.3	Motor Basic	MAIN FM	YES	NYT	Mikulas
Req.F.E.1, Req.T.E.1 , Req.T.E.2, Req.T.E.3 , Req.T.E.4	E.4	Battery Charging /Discharging	ETB	YES	NYT	David/Mikulas
Req.F.E.2 , Req.F.E.3	E.5	Battery Thermo Shock	ETB	YES	NYT	David/Mikulas
Req.F.E.4	E.6	Battery Temperature	ETB	YES	NYT	David/Mikulas
Req.F.E.1, Req.T.E.1 , Req.T.E.2, Req.T.E.3 , Req.T.E.4	E.7	Battery Drop	ETB	YES	NYT	David/Mikulas
Req.F.E.2 , Req.F.E.3	E.8	Data Acquisition AC and DC Calibration	FISH FM	YES	NYT	David
Req.F.E.4 Req.F.E.4,Req.T.E.6	E.9	Data Acquisition Data Rate	FISH FM	YES	NYT	David
Req.F.E.4, Req.T.E.6	E.10	Communication Synchronization	FISH FM, MAIN FM	YES	NYT	David/Mikulas
Req.F.E.16 Req.F.E.16 Req.F.E.16 Req.F.E.1, Req.T.E.1 , Req.T.E.2, Req.T.E.3 , Req.T.E.4	E.11	Communication Distance vs Data Rate	FISH FM, MAIN FM	YES	NYT	David/Mikulas
Req.F.E.1, Req.T.E.1 , Req.T.E.2, Req.T.E.3 , Req.T.E.4	E.12	Communication Interference	FISH FM, MAIN FM	YES	NYT	David/Mikulas
Req.F.E.1, Req.T.E.1 , Req.T.E.2, Req.T.E.3 , Req.T.E.4	E.13	Power Supply Capacity	FISH FM, MAIN FM	YES	NYT	David/Mikulas
Req.F.E.1, Req.T.E.1 , Req.T.E.2, Req.T.E.3 , Req.T.E.4	E.14	Power Supply Maximal Current	FISH FM, MAIN FM	YES	NYT	David/Mikulas
Req.F.E.1, Req.T.E.1 , Req.T.E.2, Req.T.E.3 , Req.T.E.4	E.15	Power Supply Voltage Regulators	FISH FM, MAIN FM	YES	NYT	David/Mikulas
Req.F.E.1, Req.T.E.1 , Req.T.E.2, Req.T.E.3 , Req.T.E.4	E.16	Accelerometer Temperature Stability	FISH FM	YES	NYT	David
Req.F.E.1, Req.T.E.1 , Req.T.E.2, Req.T.E.3 , Req.T.E.4	E.17	Accelerometer Bias	FISH FM	YES	NYT	David
Req.F.E.7	E.18	Optical Proximity Sensors	MAIN FM	YES	NYT	Mikulas
Req.F.E.8, F.E.14	E.19	Hall Proximity Sensors	MAIN FM	YES	NYT	Mikulas
	E.20	Magnetic Compass	MAIN FM	YES	NYT	Mikulas