Experiment Management

Organization, Personpower, Budget, and Maintenance Plan

Operational Readiness Review

October 13, 2015

Jen Raaf

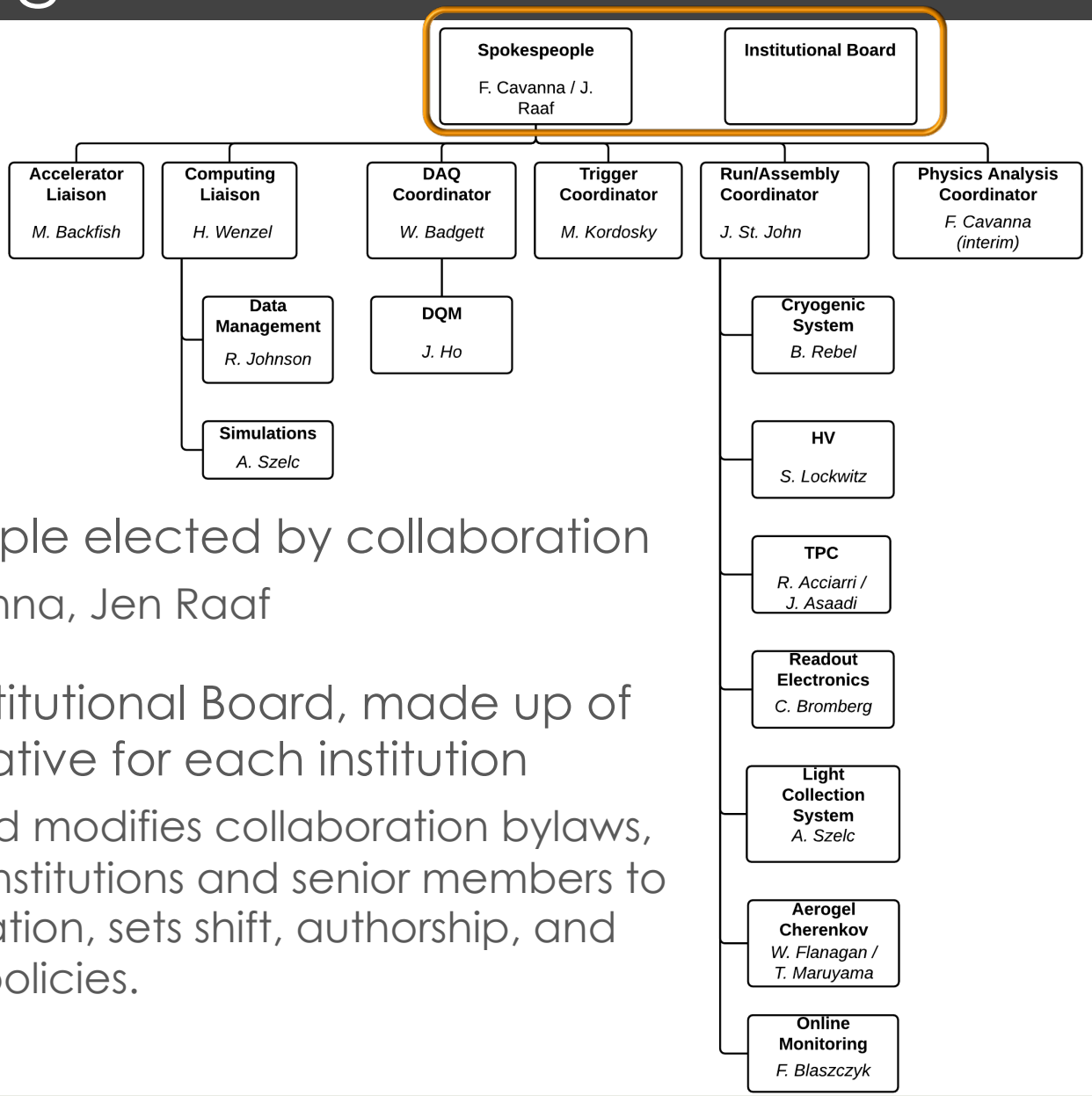
LArIAT Collaboration

- 55 PhD physicists, 13 graduate students, 8 undergraduates
- 21 institutions (8 institutions from 4 foreign countries)
  - Brazil, Italy, Japan, United Kingdom, United States

LArIAT Collaboration

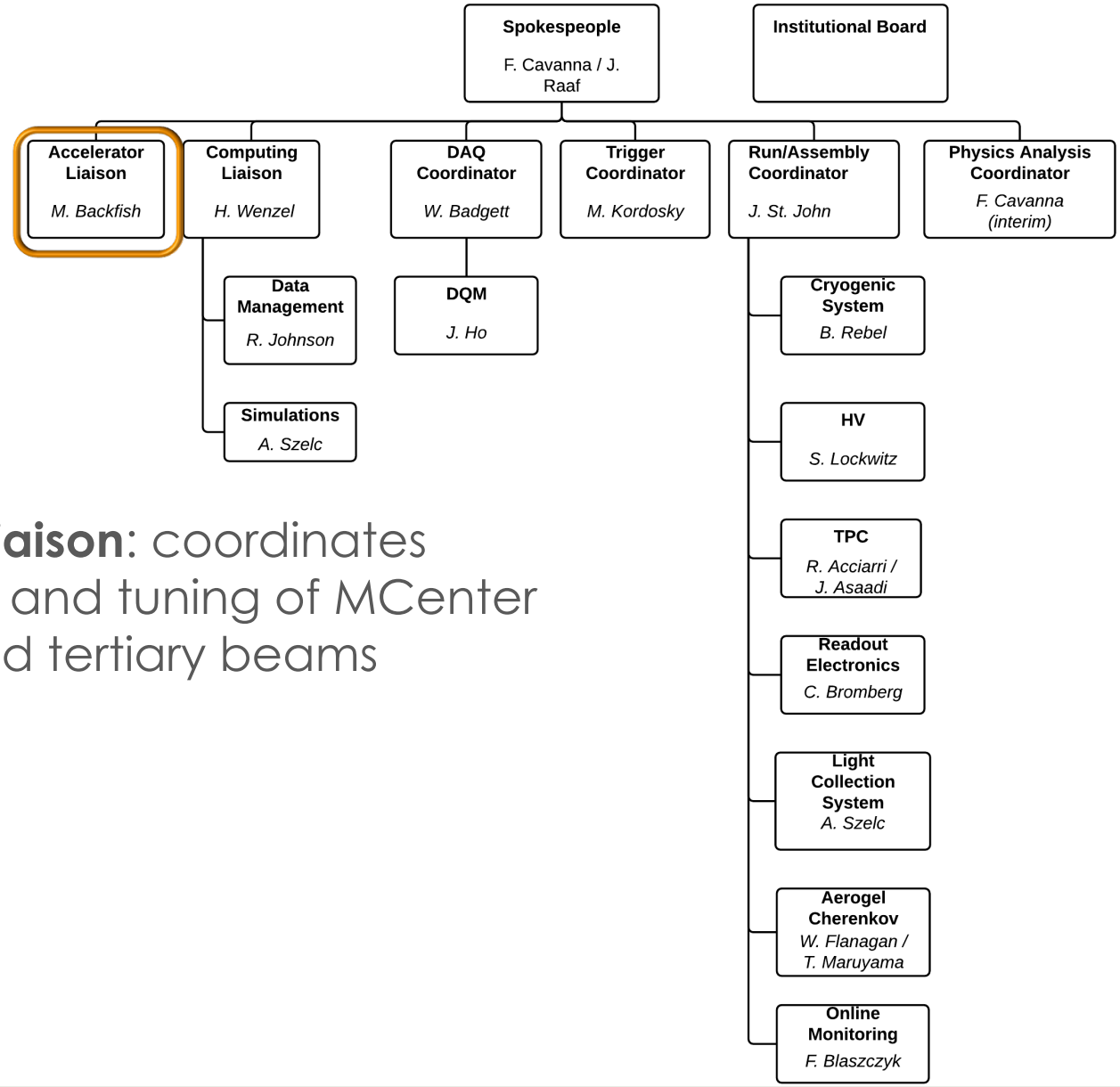
- **Federal University of ABC, Brazil (UFABC)** Célio A. Moura, Laura Paulucci
- **Federal University of Alfenas, Brazil (UNIFAL-MG)** Gustavo Valdiviesso
- **Boston U.** Flor de Maria Blaszczyk, Dan Gastler, Ryan Linehan, Ed Kearns, Daniel Smith
- **U. Campinas, Brazil (UNICAMP)** Cesar Castromonte, Carlos Escobar, Ernesto Kemp, Ana Amelia B. Machado, Bruno Miguez, Monica Nunes, Lucas Santos, Ettore Segreto, Thales Vieira
- **U. Chicago** Ryan Bouabid, Will Foreman, Johnny Ho, Dave Schmitz
- **U. Cincinnati** Randy Johnson, Jason St. John
- **Fermilab** Roberto Acciarri, Michael Backfish, William Badgett, Bruce Baller, Flavio Cavanna† (also INFN, Italy), Alan Hahn, Doug Jensen, Hans Jostlein, Mike Kirby, Tom Kobilarcik, Paweł Kryczyński (also Institute of Nuclear Physics, Polish Academy of Sciences), Sarah Lockwitz, Alberto Marchionni, Irene Nutini, Ornella Palamara (also INFN, Italy), Jon Paley, Jennifer Raaf†, Brian Rebel‡, Michelle Stancari, Sam Zeller
- **Federal University of Goiás, Brazil (UFG)** Tapasi Ghosh, Ricardo A. Gomes, Ohana Rodrigues
- **Istituto Nazionale di Fisica Nucleare, Italy (INFN)** Flavio Cavanna (also Fermilab), Ornella Palamara (also Fermilab)
- **KEK** Eito Iwai, Takasumi Maruyama
- **Louisiana State University** William Metcalf, Andrew Olivier, Martin Tzanov
- **U. Manchester, UK** Justin Evans, Pawel Guzowski, Colton Hill, Andrzej Szelc
- **Michigan State University** Carl Bromberg, Dan Edmunds, Dean Shooltz
- **U. Minnesota, Duluth** Rik Gran, Alec Habig
- **U. Pittsburgh** Steve Dytman, Matthew Smylie
- **Syracuse University** Jessica Esquivel, Greg Pulliam, Mitch Soderberg
- **U. Texas, Arlington** Jonathan Asaadi, Animesh Chatterjee, Amir Farbin, Sepideh Shahsavarani, Jae Yu
- **U. Texas, Austin** Will Flanagan, Karol Lang, Dung Phan, Brandon Soubasis (also Texas State University)
- **University College London** Anna Holin, Ryan Nichol
- **William & Mary** Mike Kordosky‡, Matthew Stephens
- **Yale University** Bonnie Fleming, Elena Gramellini

LArIAT Organization



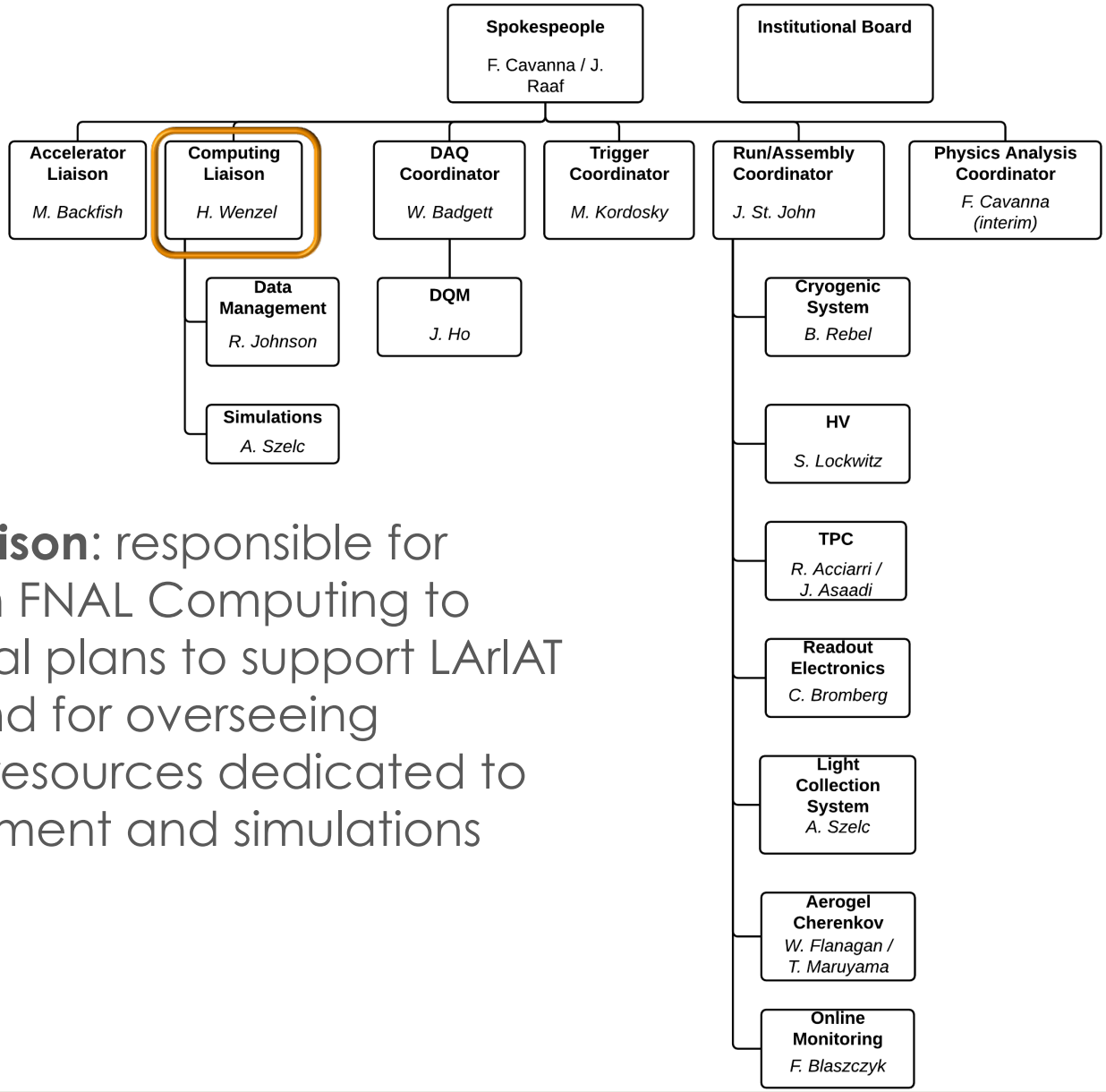
- Co-spokespeople elected by collaboration
  - Flavio Cavanna, Jen Raaf
- Advised by Institutional Board, made up of one representative for each institution
  - Approves and modifies collaboration bylaws, admits new institutions and senior members to the collaboration, sets shift, authorship, and publication policies.

LArIAT Organization



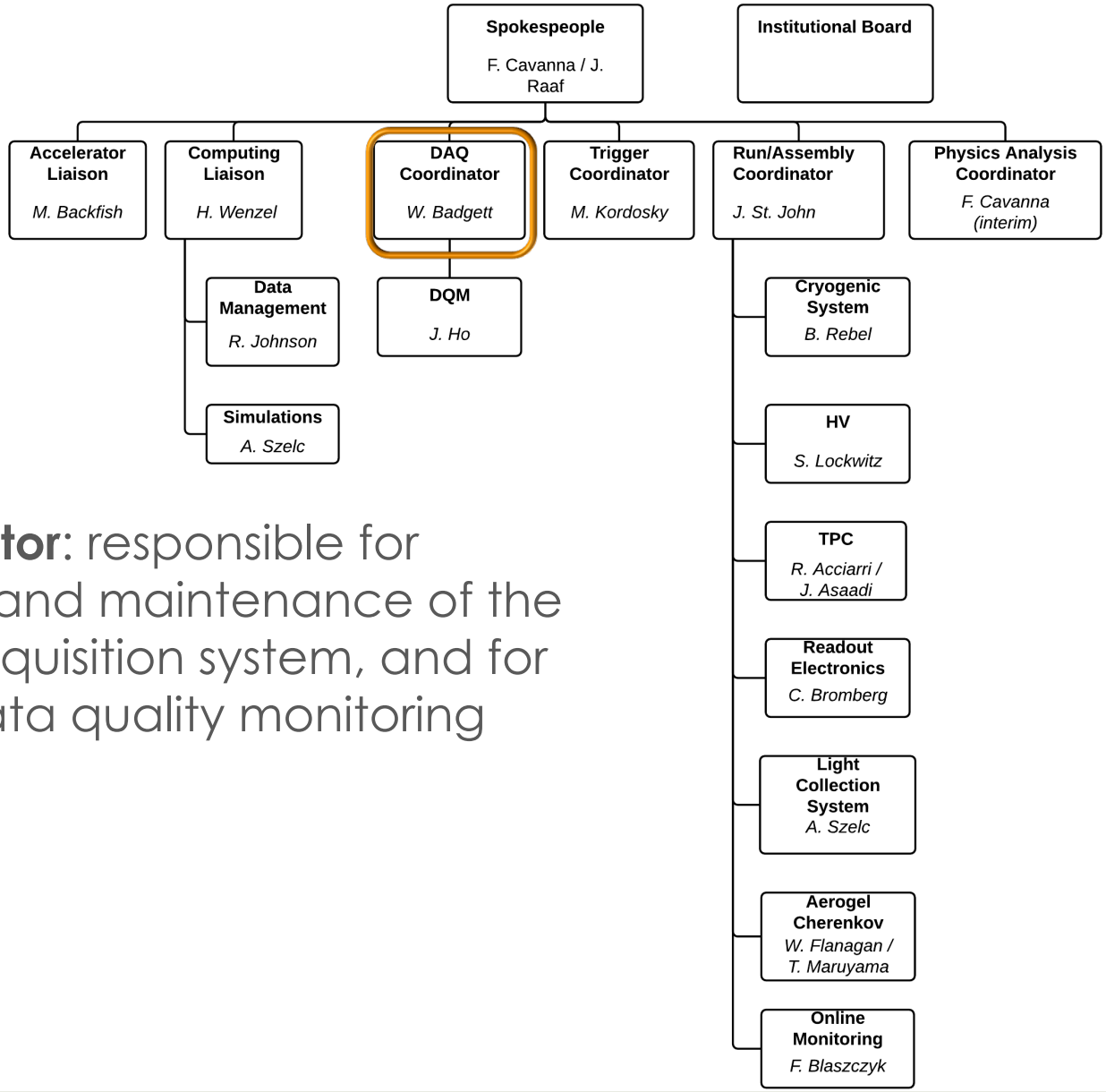
- **Accelerator Liaison**: coordinates maintenance and tuning of MCenter secondary and tertiary beams

LArIAT Organization



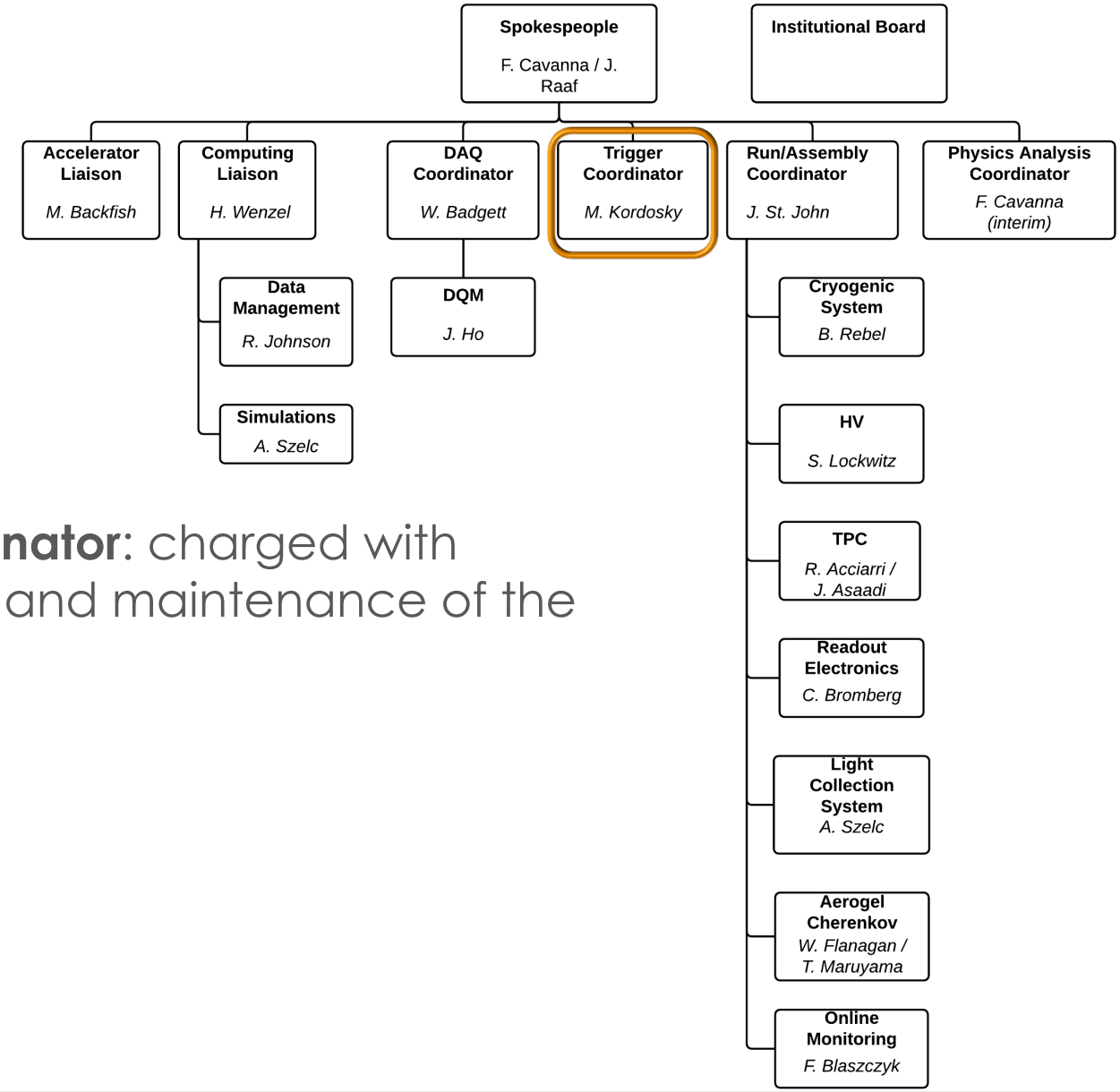
- **Computing Liaison**: responsible for consulting with FNAL Computing to develop annual plans to support LArIAT computing, and for overseeing collaboration resources dedicated to data management and simulations

LArIAT Organization



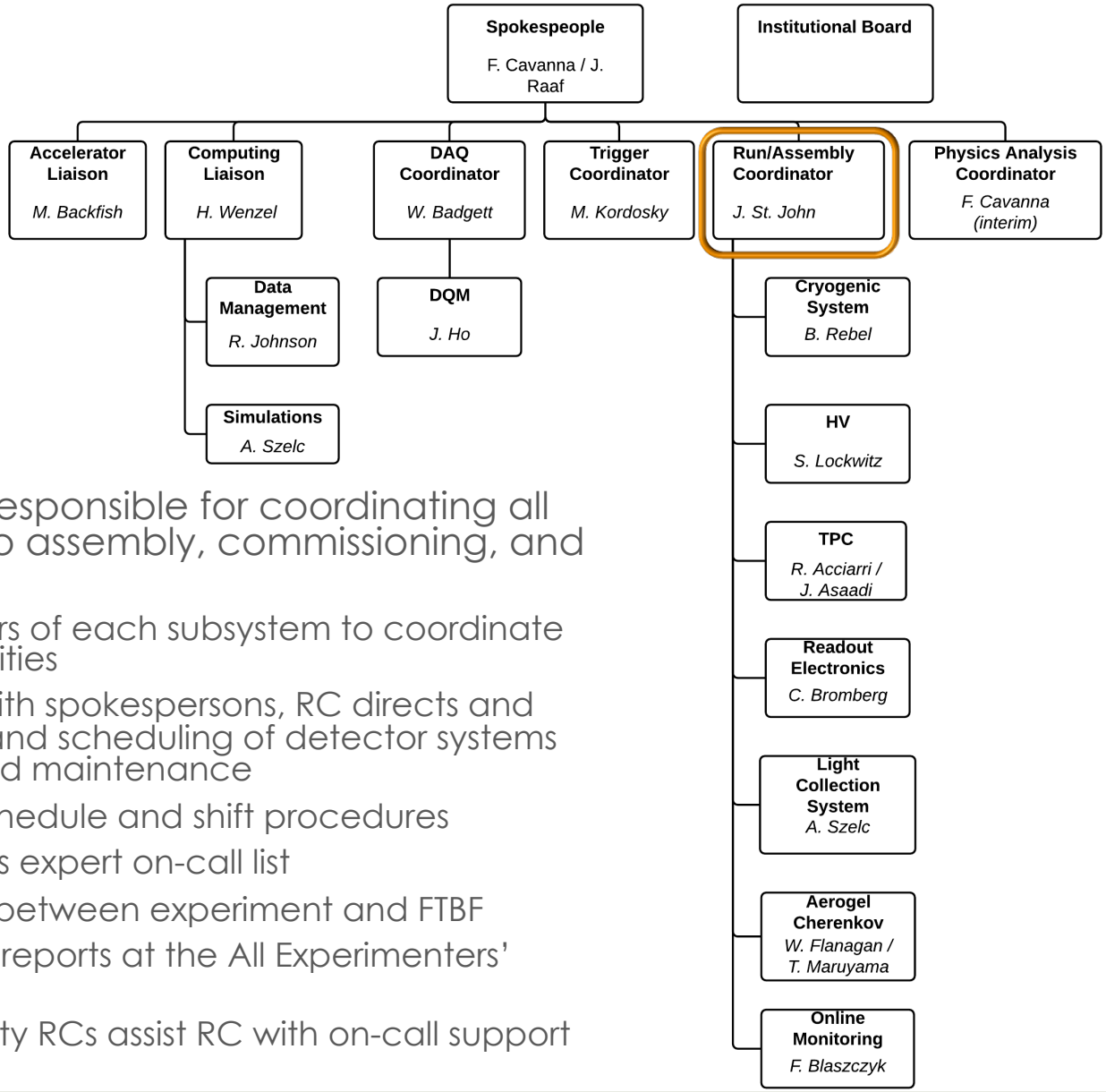
- **DAQ Coordinator**: responsible for development and maintenance of the LArIAT data acquisition system, and for oversight of data quality monitoring

LArIAT Organization



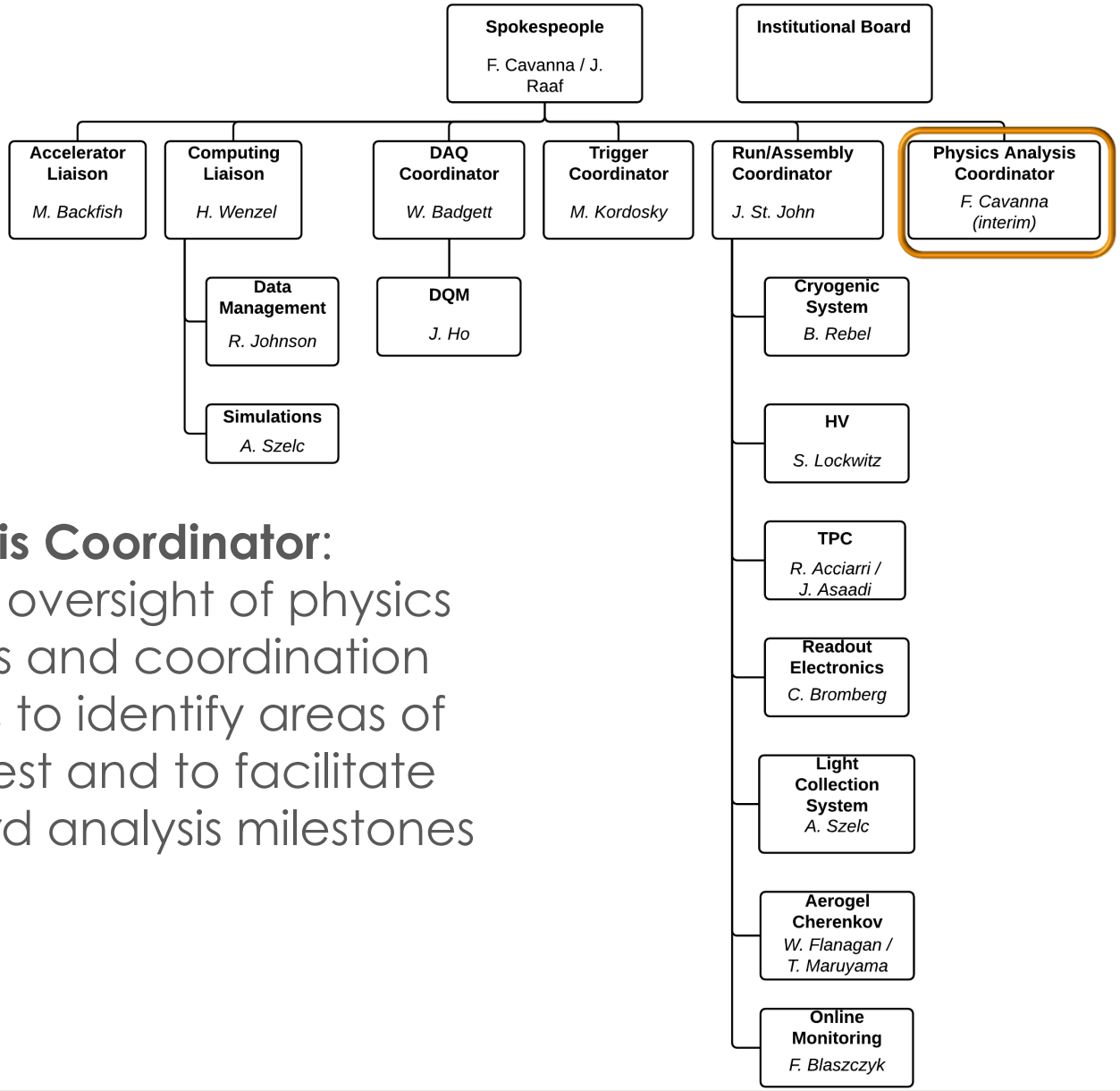
- **Trigger Coordinator**: charged with development and maintenance of the trigger system

LArIAT Organization



- **Run Coordinator**: responsible for coordinating all activities related to assembly, commissioning, and data-taking
  - Works with leaders of each subsystem to coordinate day-to-day activities
  - In consultation with spokespersons, RC directs and decides priority and scheduling of detector systems development and maintenance
  - Maintains shift schedule and shift procedures
  - Maintains systems expert on-call list
  - Primary contact between experiment and FTBF
  - Makes bi-weekly reports at the All Experimenters' Meeting
  - Appointed Deputy RCs assist RC with on-call support

LArIAT Organization

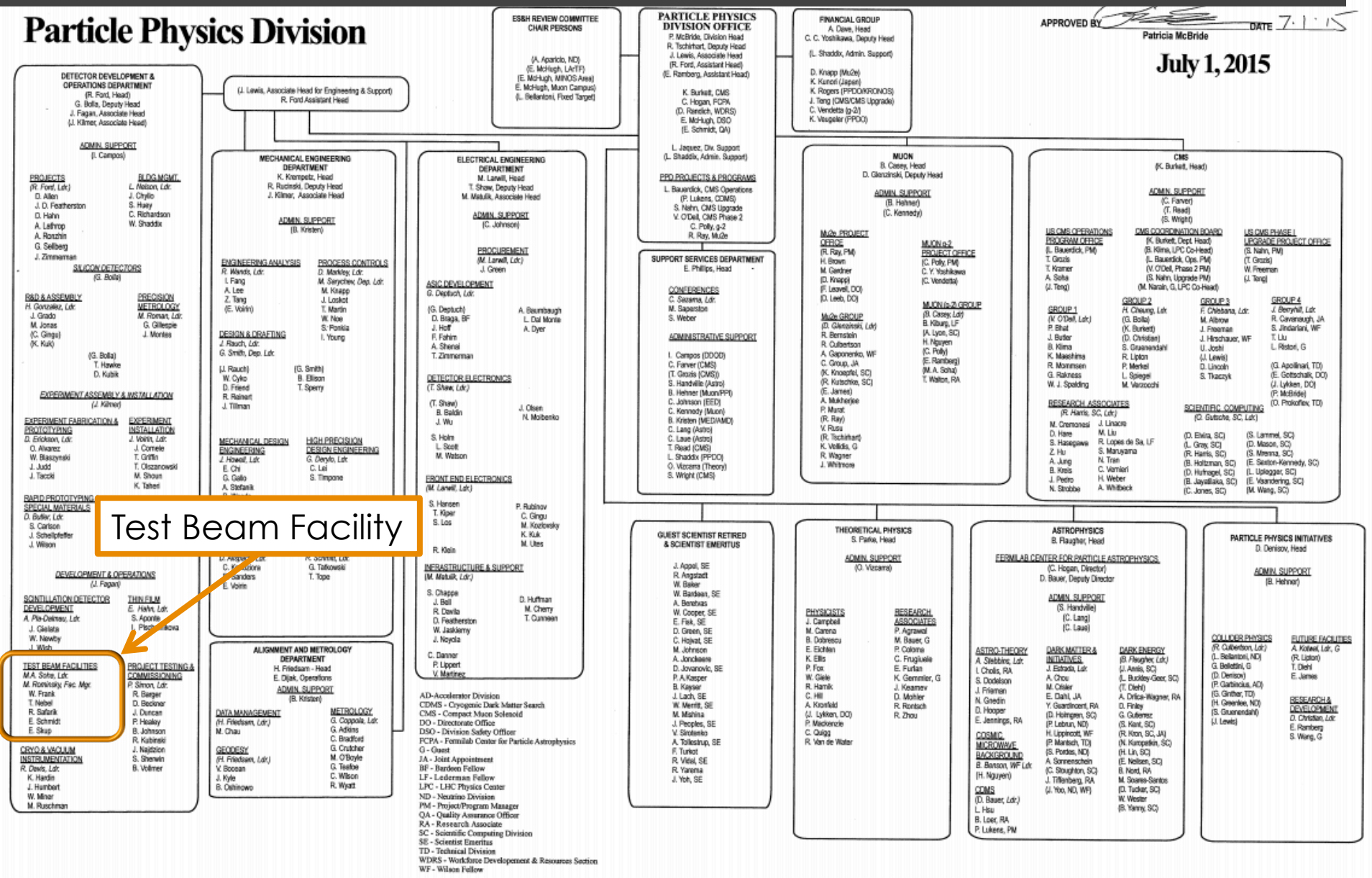


- **Physics Analysis Coordinator**: responsible for oversight of physics working groups and coordination among groups to identify areas of common interest and to facilitate progress toward analysis milestones

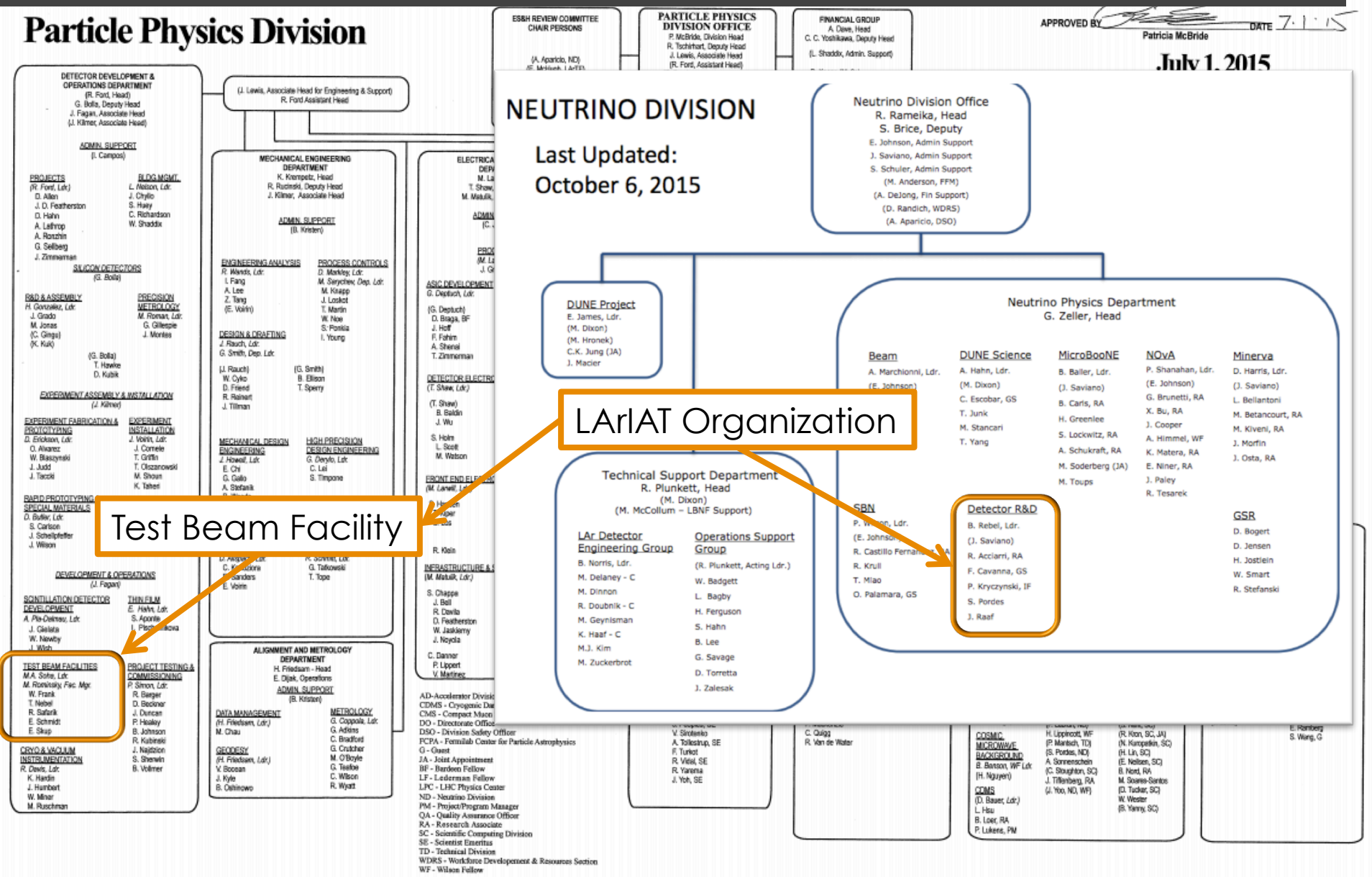
Shifts

- Shifts are institutional responsibility with shifts shared equally by all PhD physicists and graduate students
  - Responsible for:
    - Following run plan set by Run Coordinator
    - Seeing that detectors are operating properly
    - Verifying data quality, as determined by online monitoring tools
- Shifts run 24/7 when there is LAr in the cryostat, regardless of whether the beam is on or off
  - 3 shifts per day, each with 1 shifter
  - On-call Controlled Access Leaders provide assistance when problems arise that are beyond expertise of shifters
- Run-I shifts were taken in the MCenter control room. In Run-II, we will take some shifts in ROC-West, with *eventual goal to have remote shifts at other institutions*.
- The shift policy will evolve with time

LArIAT within Fermilab Organization



LArIAT within Fermilab Organization



Responsibilities & Maintenance of Electronics

System	Responsibilities
High Voltage Supplies	Repair or replacement by Fermilab LArIAT and AD
Low Voltage Supplies	Repair or replacement by Fermilab PREP
Scintillator paddles & PMTs	Repair and maintenance by Fermilab LArIAT and FTBF
MWPCs	Repair and maintenance by FTBF
Aerogel Cherenkov detectors	Repair and maintenance by UT Austin and KEK
Cold Electronics & D2S Cards	Repair and maintenance by Michigan State University
CAEN digitizers	Repair and maintenance by LArIAT/Neutrino Division
NIM logic	Repair or replacement by Fermilab PREP
Synoptic/ACNET	Repair and maintenance by Fermilab AD
Cryogenic system	Repair and maintenance by Fermilab PPD and ND
Detector Control & Monitoring System	Repair and maintenance by Boston University
Data Acquisition System	Maintenance by ND with assistance from several collaborating institutions

Spares

Item	Spares	# used in LArIAT	Anticipated purchases FY16	Comments
CAEN V1740 digitizers	0	9		
CAEN V1751 digitizers	0	2		
CAEN V2718 VME master	0	1		
CAEN V1495 FPGA trigger	0	1		
CAEN A3818 PCI-to-VME bridge	1	1		
CAEN VME crate and PS	1	1		
MWPCs	3	4		FTBF-owned
ASIC boards	2	9		
Glassman HV PS	1	1		
LV PS	1	2		
Wiener VME chassis	1	1		
Wiener power supply	0	1		

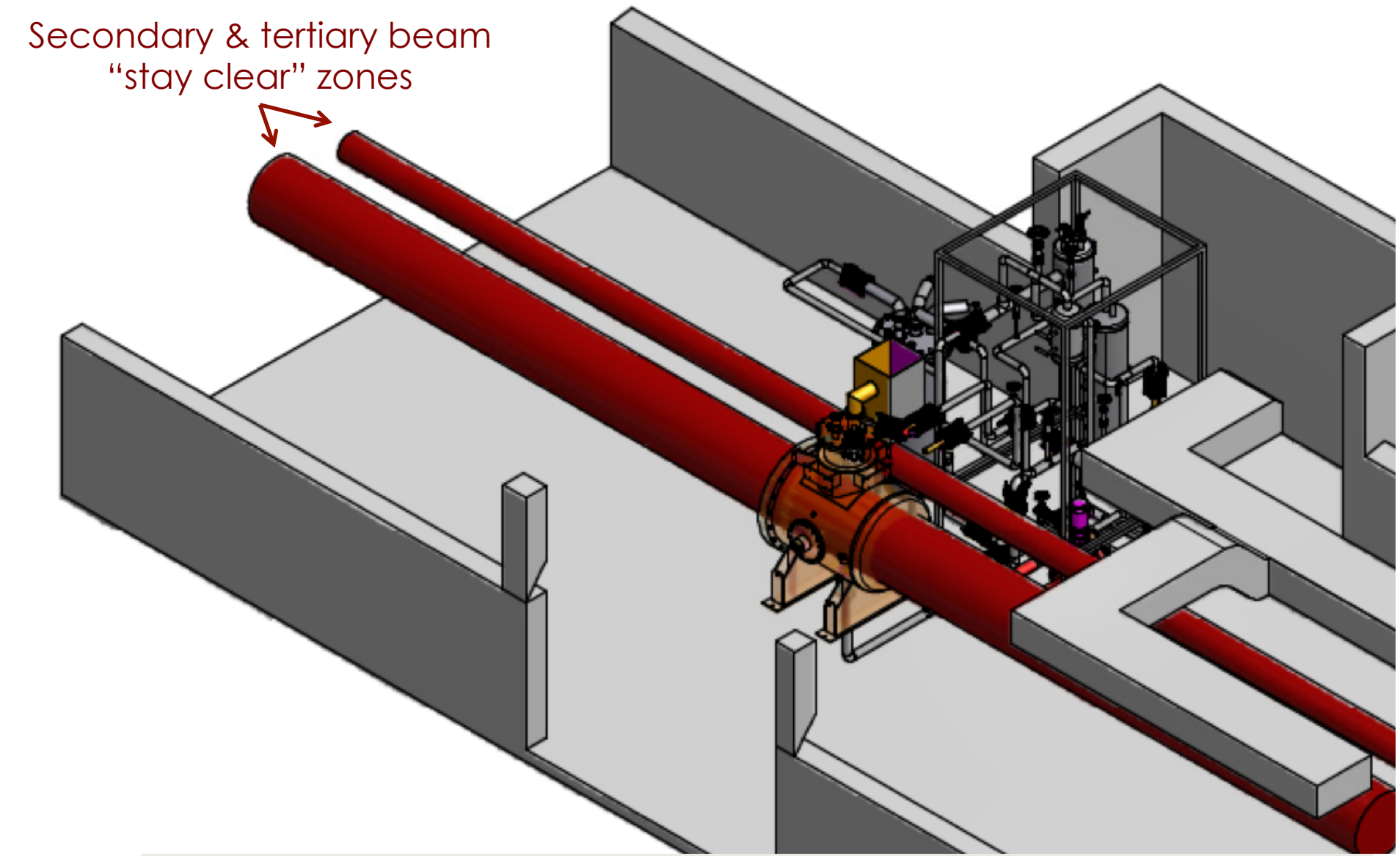
- We have no spares for the backbone of our DAQ (CAEN modules). Worrisome…
- FY16 budget is not yet finalized, but we hope for some money to buy a few spares.

Cryogenic System

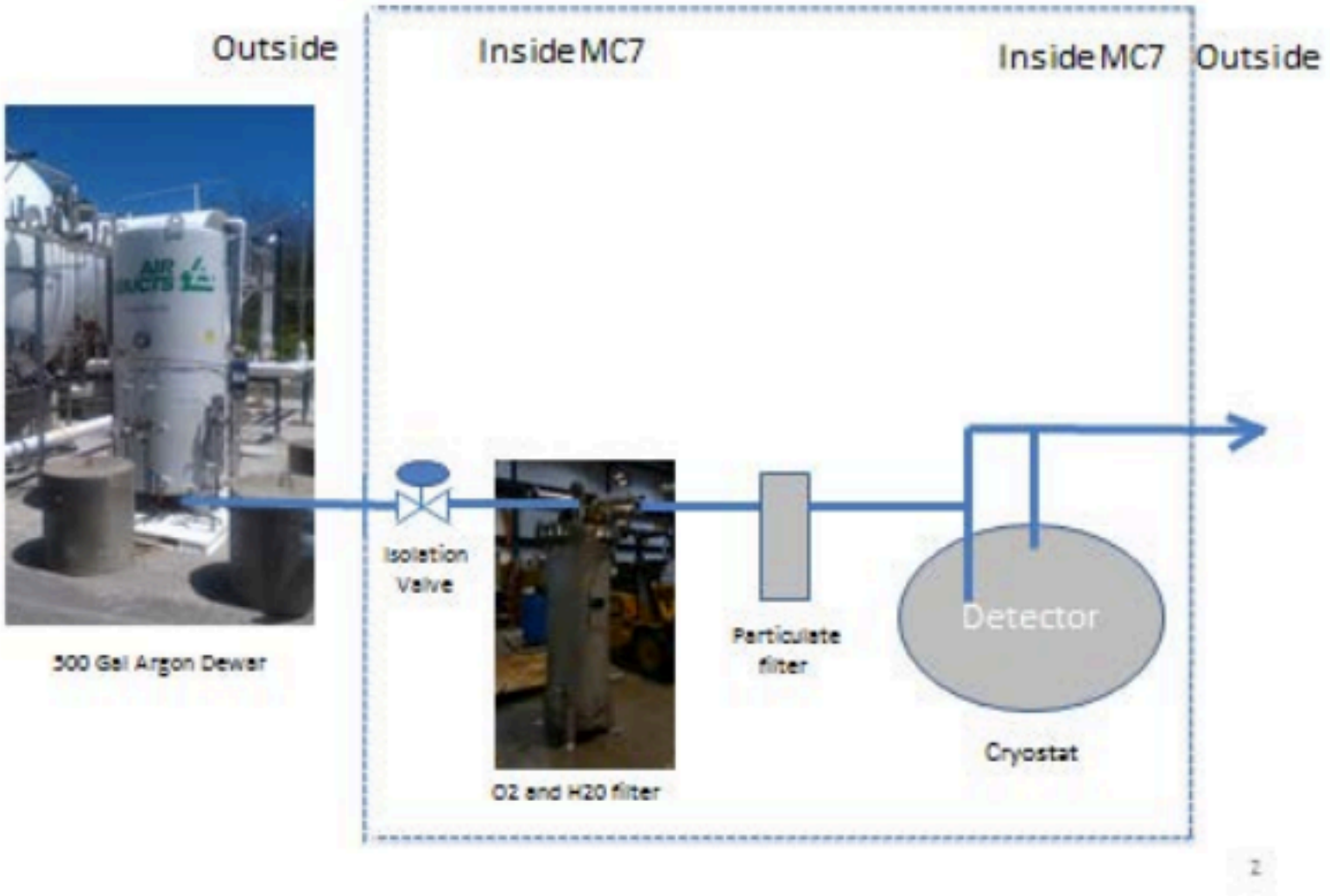
- Original plan was to install a closed-system filtration/ recirculation system purchased from Eden Cryogenics
  - Delivery of this system was originally promised in early 2014, and so the plan was to install in Spring 2014, and to take data starting Summer 2014
  - Delivery date pushed back to late 2014, which would have eliminated possibility to take data in 2015

  → Decision made to install a simplified alternate "Plan B" system
    - Single-pass purification, boil off argon
  - *In the end, this was a good choice, since the Eden system was not delivered until June 2015 (near the end of our Run-I)*

Full Eden System (Original Plan)



Plan B Single-Pass System



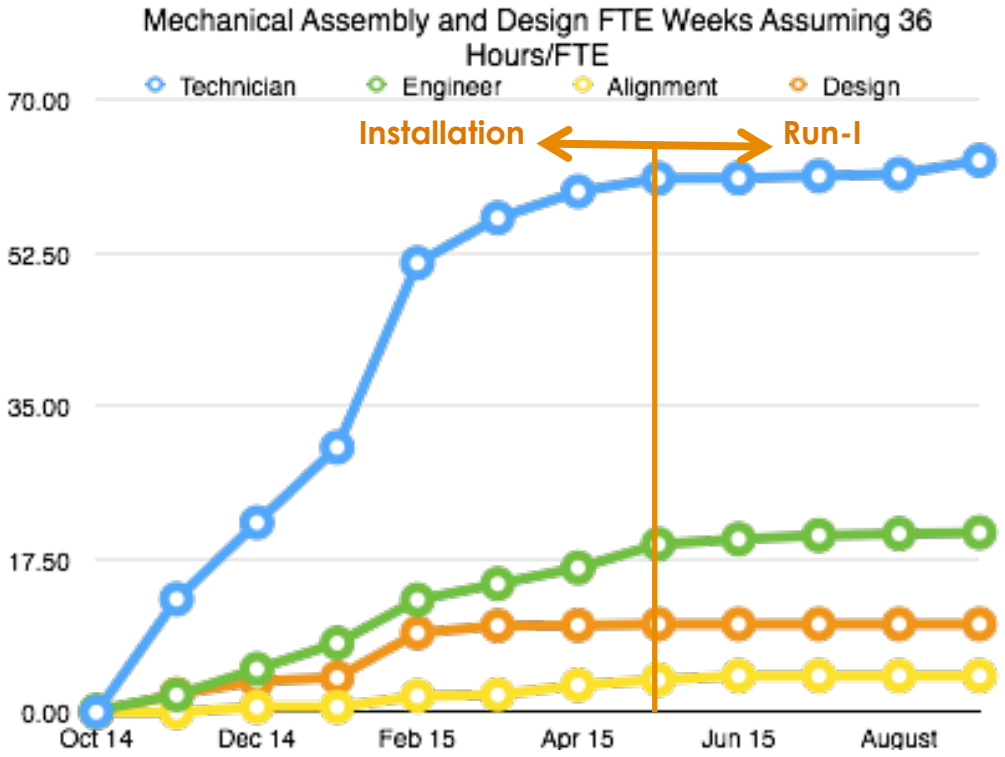
M&S Expenditures: FY14 & FY15

	FY14	FY15	Total
Filter Skid	$116891.00	$0.00	$116891.00
Gas Analyzers and Switchyard	$78621.50	$0.00	$78621.50
Electronics	$97600.00	$186.00	$97786.00
Installation Materials	$115276.36	$62626.35	$177902.71
Controls	$30801.69	$3568.30	$34369.99
Eden Skid	$227987.10	$36908.79	$264895.89
Operations	$0.00	$35671.84	$35671.84
Liquid Argon	$0.00	$48573.08	$48573.08
Total	$667177.65	$187534.36	$854712.01

- *Purchase of Eden cryogenic system and parts for Plan B system* account for majority of M&S cost to get LArIAT up and running
- Labor was also a significant contribution (next slides)

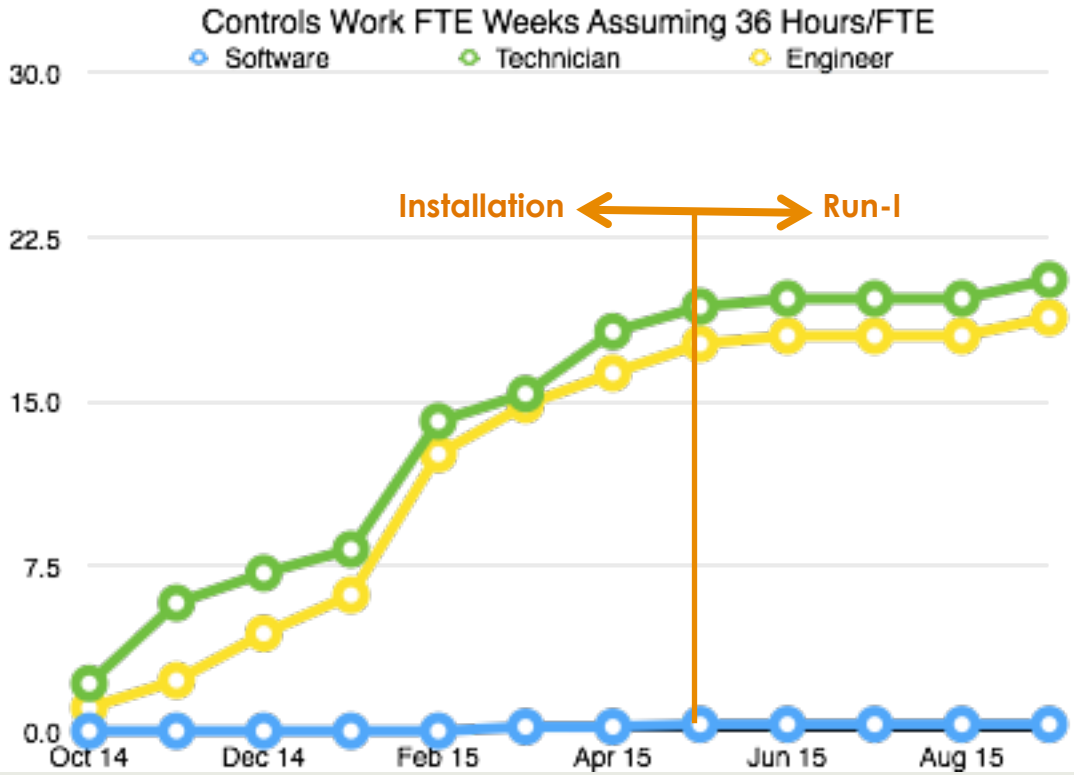
Mechanical Assembly & Design Labor

	Reported hours														
	Oct 14	Nov 14	Dec 14	Jan 15	Feb 15	Mar 15	Apr 15	May 15	Jun 15	Jul 15	Aug 15	Sep 15	Total	Total FTE Weeks (36 hrs)	Total Installation FTE Weeks
Technician	0	466	315	310	759	185	109	54	1	9	8	56	2272	63.11	61.06
Engineer	8	63	107	107	178	66	66	97	21	15	7	5	740	20.56	19.22
Alignment	0	0	22	0	45	5	40	22	16	0	0	0	150	4.17	3.72
Design	0	74	54	15	184	29	2	5	0	0	0	0	363	10.08	10.08



Cryo Controls Labor

	Reported hours														
	Oct 14	**Nov 14**	**Dec 14**	**Jan 15**	**Feb 15**	**Mar 15**	**Apr 15**	**May 15**	**Jun 15**	**Jul 15**	**Aug 15**	**Sep 15**	**Total**	**Total FTE Weeks (36 hrs)**	**Total Installation FTE Weeks**
Software	0	0	0	0	0	7	0	4	0	0	0	0	11	0.31	0.31
Technician	78	132	49	39	210	45	102	41	13	0	0	31	740	20.56	19.33
Engineer	38	45	77	63	231	81	52	48	13	0	0	30	678	18.83	17.64



Cryo System Options

- Time/cost to convert to Eden cryogenic system
  - Estimate 6-12 months labor (for removal of Plan B system and installation of Eden system), requires engineers & techs & drafter
  - ~$95k M&S
  - After installation, operating cost would be $100/day ($LN_2$)
- Cost to run existing "Plan B" system
  - Based on 10 weeks of system running
  - Exterior LAr dewar rental + LAr filling once/week: $33k
  - Daily cost to run: ~$470/day
- Slight improvement to "Plan B" system
  - Phase separator wasn't working very efficiently during Run-I
  - Modification: 4 weeks engineering & tech manpower
  - Expect ~15-20% reduction in operating cost with this modification (~$375/day)

  → Can run for ~1 year before Plan B operating costs surpass cost to convert to Eden system. In discussions with Neutrino Division, this is the option that was chosen.

Summary

- LArIAT will continue using the "Plan B" cryogenic system during Run-II, which is expected to be a few months duration
  - Whether to eventually convert to Eden system is a decision that needs to be made between heads of PPD ("owner" of FTBF) and ND ("owner" of LArIAT experiment)
- Collaboration functioned smoothly during Run-I
- LArTPC and beamline hardware also functioned smoothly during Run-I, thanks in large part to the dedicated team of collaboration members