

**Research, Engineering, and Development Advisory Committee (REDAC)
National Airspace System (NAS) Operations Subcommittee | MINUTES**

Date: *September 12-13, 2017*
Location: *Washington DC (Conference Room varies by date)*
Purpose: *Review of FY18-19 Proposed Portfolio; Provide Guidance and Recommendations; Program Deep Dives*
Facilitator: *Francisco Bermudez, Designated Federal Officer (DFO)*
Note Takers: *Sadaf Alam*
Joe Ivkovic

Upcoming Meetings:

- *March 27-28, 2018, Washington, DC*

Day 1 – September 12, 2017 (Engility Conference Room)

Review of REDAC Recommendations, Responses, and Open Actions

Presenter *Leo Prusak/Francisco Bermudez*

Summary: The Chairman, Mr. Prusak opened the meeting with a review of Prior Action Items, Current Action Items, and Finding and Recommendations (F&Rs) status. The subcommittee decided that they would later address the Operations Concept Validation (Spring_2017_1) F&Rs. A final resolution on the subcommittee's decision regarding these items was postponed until after the Runway Incursion Reduction Program (Spring_2017_2) presentations later in the agenda. The subcommittee inquired about when the National Aviation Research Plan (NARP) document would be available. The subcommittee was advised that the NARP was going through a redesign to provide additional clarity of its content, as suggested by the subcommittee. The NARP would also include a five-year outlook. The March 2016 action for an FAA presentation for the Deep Dive – Demonstrate Aviation Weather (Wx) Products was considered closed after Ms. Starr McGettigan's Deep Dive briefing on UAS Weather later in the meeting. The action item from August 2015 regarding the weather concepts from requirements to implementation remains open. The current action item from August 2016, regarding providing the subcommittee a copy of the UAS Implementation plan, remains open.

Presentation Budget Briefing

Presenter *Mike Gallivan*

Summary: Mr. Gallivan reported the FAA FY 2017 budget request of \$15.899B comprised approximately \$9.99B for Operations, \$2.8B for Facilities & Equipment, \$166M [post meeting corrected to \$167M] for Research, Engineering, and Development (RE&D), and \$2.9B for Airports. The FAA RE&D FY18 President's Budget Request is for \$150M. This request has not been signed. The House Appropriation Committee has proposed an FAA RE&D FY18 budget of \$170M. The Senate Appropriation Committee has a proposed an FAA RE&D FY18 budget of \$179M. The subcommittee inquired about the Senate and House FY18 budget cuts for Aeromedical Research. The FAA

received no rationale for the budget cuts to aeromedical research. The subcommittee inquired about the Senate and House FY18 budget increase, with emphasis on UAS. The FAA received no rationale for FY18 budget increase.

Presentation 1A10D NextGen – New Air Traffic Management Requirements
Presenter *Francisco Bermudez, ANG-C72*

Summary: At the subcommittee's request, Mr. Bermudez provided a presentation on the New Air Traffic Management (ATM) Requirements. This presentation focused on the benefits, research goals, accomplishments, and future plans of the New ATM Requirements. The New ATM Requirements program is needed to identify new opportunities to improve the efficiency and effectiveness of air traffic management operations. Activities include the research and development of procedures, tools, and systems in support of operational improvement. The subcommittee requested to examine how New ATM Requirements align with the new NextGen Advisory Committee (NAC) priorities. For the Spring 2018 REDAC meeting, the subcommittee required that this briefing contain a more detailed funding level allocation of each New ATM Requirements project.

Presentation Deep Dive FAA Pathfinder – Focus Area 1, 2, and 3
Presenter *Rob Pappas*

Summary of Briefing: Mr. Pappas detailed the programs coordination with CNN in developing ways Unmanned Aircraft Systems (UAS) may be used to operate safely over populated areas. The key regulation in Pathfinder Focus Area 1 is FAR Part 107.39. The goal is to develop a waiver process for Federal Aviation Regulation (FAR) Part 107.39, which allows operations over people, a repeatable waiver process, and the development of a viable technical approach for the validation of safety risk testing and mitigation. Mr. Pappas transitioned to FAA Pathfinder Focus Area 2: Extended Visual Line of Sight (EVLOS). The goal of Pathfinder 2 is to safely expand the operational envelop of UAS to include EVLOS Operations. Step III-Phase III of the program is nearing completion. Pathfinder Area 3: Beyond Visual Line of Sight (BVLOS) began by detailing their Concept of Operations. Pathfinder 3 has completed 2 of 3 phases. Phase III was underway with expected completion in late 2017. Phase III explores new research of BVLOS flight in Class G airspace, explores performance of airborne Detect and Avoid (DAA) sensors, and will develop methods to safely operate in controlled airspace (Safety Risk Management Document [SRMD] process).

Presentation A11.K Deep Dive - UAS Weather
Presenter *Starr McGettigan*

Summary of Briefing: This program focuses on the research of weather information and capabilities needed for safe and efficient UAS operations. Ms. McGettigan began the presentation by giving an overview of program accomplishments to date, which included analysis on weather impacts, analysis on UAS weather information gaps, a briefing of initial research findings to FAA UAS community, and an ongoing

collaboration effort with UAS FAA organizations. Two case studies were provided. The first was a survey and mapping study. The main focus on this study was low-altitude UAS operators and the weather tolerances for these UAS. The study detailed the operation of a DJI Phantom III UAS in the Miami area. The outcome of this study provided weather tolerances for the DJI Phantom III UAS. The second study detailed a maritime surveillance case. The main focus of this study was for high-altitude UAS operators and the weather tolerances for these UAS. The study detailed the operation of a Global Hawk UAS on a flight from the Miami area to the Boston area. This study provided weather tolerances for the Global Hawk UAS. It was noted that winds aloft forecasts at these altitudes lack precision. As a result, this study could not provide a conclusive wind aloft tolerance for the Global Hawk UAS. The subcommittee suggested that this program seek collaboration with weather balloon operators in an effort to address this gap. The subcommittee also expressed concern that the pace of UAS development is exceeding that of FAA research and analysis.

Presentation A11.K Aviation Weather Research Program (AWRP)

Presenter *Danny Sims*

Summary: Mr. Sims started the briefing by giving a short overview of the AWRP. He informed the subcommittee that the AWRP works very closely with the National Oceanic and Atmospheric Administration (NOAA) and the National Weather Service (NWS) to meet NextGen's requirements. Mr. Sims pointed out that with the expected reduction of funding, AWRP would not stretch current projects; AWRP will cut certain projects. The rationale being that AWRP would be unable to sustain the current level of effort with a reduced budget in FY18-forward. The subcommittee concurred with Mr. Sims's conclusion. The briefing transitioned to cover recent program accomplishments and future plans. AWRP conducted an internal performance assessment analysis of the program. The subcommittee inquired if the research program changed based on what the program learned during the performance assessment analysis. When asked, the FAA noted that the entire research program does not necessarily change, but the individual capability does change.

Presentation A11.N Commercial Space Transportation (CST) RE&D Program

Presenter *Paul Wilde (For Di Reimold)*

Summary: Mr. Wilde began the briefing by giving an overview of the CST program and its structure. CST is broken down into four Research Areas—Research Area One: Space Traffic Management & Spaceport Operations; Research Area Two: Space Transportation Vehicles; Research Area Three: Human Space Flight; and Research Area Four: Space transportation Industry Viability. The presenter reminded the members of the relatively small budget of \$2 million that is allocated to CST. This funding will be spread across these four Research Areas. The subcommittee questioned the fourth Research Area, which has a vision of long-term industry growth. The subcommittee questioned how the CST program will promote industry growth. The briefing transitioned to cover recent program accomplishments, goals, and current projects within each Research Area. It was pointed out that the key to integrating CST

within the NAS is the FAA's implementation of Time Based Flow Management (TBFM). The subcommittee expressed confusion as to how TBFM would help integrate CST into the NAS. A subcommittee member inquired if there are any requirements on non-operative R&D systems, to which the FAA confirmed that research is currently being done on Department of Defense assets.

Presentation 1A01C Operations Concept Development & Infrastructure (ATDP)

Presenter *Maureen Keegan*

Summary: Ms. Keegan began the briefing by informing the REDAC that the FAA is proceeding with NAS modernization based on the NextGen Operational Concept for 2025. This program assesses the interaction of changing roles and responsibilities of NAS service providers and pilots, airspace changes, procedural changes, and new mechanized systems for distributing weather, traffic, and other flight related information. The program uses analyses and associated white papers to validate whether future system requirements meet NextGen goals, including ERAM, data communications, the future voice switch, changes in surveillance requirements and associated procedures, and the establishment of new roles and responsibilities to support increased productivity. ATDP will develop methods, metrics, and models to demonstrate that the modernized systems can handle anticipated growth in traffic demand according to Terminal Area Forecasts for incremental years. The subcommittee and Ms. Keegan agreed that NextGen will be responsible for the earlier concept work of ATDP. ATDP detailed their main Research Focus Areas. These Research Focus Areas include PBN and Time, Speed, Spacing Tools Optimization, Cross-Capability Integration Analysis, and Improved TBFM/TFMS Data Integration. The subcommittee requested a more in-depth explanation on how the concept and engineering work trickles down to work packages. The subcommittee requests to receive a briefing focusing on how the concept analysis work is executed from NextGen into Implementation for the next REDAC meeting.

Presentation 1A01A Runway Incursion Reduction Program (RIRP)

Presenter *Ben Marple and James Fee*

Summary: The RIRP's objective is to continually discover, research, implement, maintain, and innovate technologies that will detect the incorrect presence of an object in the Runway Safety Area at every airport, and deliver a directive cue to the operator who can take corrective action. Mr. Marple delivered the RIRP programs response to the REDAC recommendations. Anticipated research activities were detailed for FY18 and FY19. These activities included, advanced Runway Incursion (RI) technology procurement for Runway Incursion Prevention Shortfall Analysis (RIPSA), Small Airport Surveillance Sensor (SASS) surveillance capability development and testing, and initiate research on Surface Taxi Conformance Monitoring (STCM). A subcommittee member questioned if the safety risks have been identified and if quantifiable risk assessments are available; the member was informed that the FAA was still in process of quantifying these risks by bringing the program to the Acquisition Management System (AMS) lifecycle. Mr. Fee reminded the members that there are over 400 airports in the United States that have no technology and are at high risk for runway incursions.

The subcommittee requests that RIRP provides additional information regarding RIPSAs, SASS, and STCM. The subcommittee would like the program to further elaborate on the last meeting's findings: (1) identify the causal factors associated with runway incursions at small and medium airports; and (2) identify feasible runway incursion prevention technologies to address those factors. The DFO will facilitate coordination between the subcommittee and the RIRP program office to provide the requested clarification on the program.

Presentation *Out brief from the 2017 USA-EU ATM R&D Seminar*

Presenter *Bruce Holmes*

Summary – Mr. Holmes detailed the 2017 USA-Europe ATM R&D Seminar. The ATM R&D seminars help develop solutions that are globally relevant, in compassing Single European Sky ATM Research (SESAR), NextGen, and other international programs. The participants included various Academia, Industry, Government and, Air Navigation Service Providers (ANSP). The technical advancements presented at seminar highlighted the goals of the U.S. Next Gen and EU SESAR air traffic management concepts that have been held back by the absence of affordable, bi-directional, low latency connectivity. Strong themes that emerged at the keynote and technical papers focused on the digital aviation ecosystem and continuous replanning and optimization.

Presentation *Implications to NAS Management from recent Industry Developments*

Presenter *Leo Prusak*

Discussion – FAA William J. Hughes Technical Center's (WJHTC) Director, Ms. Shelley Yak, posed the following three questions to the subcommittee members: "Are there R&D areas within the NAS operations subcommittee that should be lower/higher priority? Are there R&D areas that the FAA is not examining that should be added to the NAS OPS subcommittee? What do you see coming on the horizon regarding NAS Operations that may require future R&D efforts?" The subcommittee decided to use the current Research, Engineering, and Development Advisory Committee's (REDAC) chairman, Dr. Robert John Hansman's responses from 2014 as a basis to respond to these questions.

Presentation Day-1 Overview and Recap

Presenter *Leo Prusak*

Discussion – The subcommittee discussed a new action to have MITRE come to the next REDAC to provide a deep dive briefing on the Precision Hawk project associated with Pathfinder. The subcommittee also took a new action to get a representative from UBER Elevate to the next REDAC meeting. The subcommittee gave an action to RIRP—RIRP will hold teleconference meetings via WebEx to provide greater clarity on each project’s function. They also opened an action to receive a briefing focusing on how the concept analysis work is executed from NextGen into Implementation. Another action was regarding the New ATM Requirements briefings. The subcommittee requested: a) an examination of how the program’s requirements align with the new NAC priorities; b) an explanation of how the program relates to RTCA work; c) an explanation of how the \$7.5 million is spent on R&D funding efforts; and d) the future requirements for the research being done on the workstations. On the CST briefing, the subcommittee requested more clarification on why TBFM is considered the key to commercial space integration. Also, more clarity is needed on the allocation of funds across the four Research Areas. The subcommittee suggested removing two of the four Research Areas. Per the DFO’s suggestion, a briefing from the Centers of Excellence (COE) will be beneficial for the committee.

Day 2 – September 13th (Engility Conference Room)

Presentation 1A07A0/1A08A0 NextGen Air Traffic Controllers (ATC)/Technical Operations (Tech Ops) Human Factors

Presenter *Bill Kaliardos*

Summary: This program focuses on documenting and transitioning Human Factors Lessons Learned from concept exploration and early implementation activities. NextGen ATC/TechOps Human Factors promotes the use of Human Factors Best Practices, Human Performance Metrics, and Human Factors Standards in the early phases of NAS programs and procedures. Mr. Kaliardos detailed the program’s FY17 accomplishments and completed research. The briefing transitioned to cover current and planned research under FY16 and FY17 Project Level Agreements. The research includes PBN Human Performance Metrics, Established on Required Navigation Performance (EoR) Human Factors Integration Considerations of Time, Speed, and Spacing Tools, and Human Performance Consideration for Contingency Operation in a Degraded NextGen Environment. The subcommittee expressed concern that the budget for this research was not provided in the briefing. The subcommittee recommended that additional funding information be included in the presentation. The DFO stated that suitable funding information would be incorporated into slides during the next NAS Ops meeting.

Presentation 8BA000 Air Traffic Control/ Technical Operations Human Factors

Presenter *Dan Herschler*

Summary: Mr. Herschler provided a brief overview of the ATC/Tech Ops Human Factors program. The program's purpose was not only to provide technical sponsors with timely and appropriate Research and Development products and consultation services that improve safety and efficiency of complex ATC systems, but also to provide support to Human Factors efforts for FAA acquisition programs. He explained the benefits of the program to the FAA and what determined its success. He further addressed the program's R&D needs within the five focus areas and elaborated on the human factors standards. Mr. Herschler highlighted the program's accomplishments in the areas of workforce optimization, improved safety, NAS Technology Integration, and human performance enhancements. The subcommittee expressed concerns regarding whether these systems were designed to interact with one another. The risks regarding the Research Requirements Process Transition were also discussed.

Presentation A12.E Weather Technology in the Cockpit (WTIC)

Presenter *Gary Pokodner*

Summary: The program focuses on identifying causal factors for weather related General Aviation (GA) safety risks and hazards. The program promotes enhanced safety by trying to reduce/resolve adverse weather risks before they can result in an accident, using increased information and training to pilots. Mr. Pokodner explained the current and planned accomplishments for selected projects, such as the Wind Study, Remote Oceanic Meteorological Information Operational (ROMIO), Eddy Dissipation Rate (EDR) Technology Transfer (TT) project, and Crowds and Clouds. He also mentioned that pilots may not trust and want to use the new technology, and therefore, the program is using operational demos to help pilots stay on board. Mr. Pokodner presented the accomplishments of his projects by describing how the recipients used the findings/outputs of his projects. He concluded with the new projects WTIC was working on for FY17/18. The subcommittee emphasized that the WTIC program was of high value and a beneficial activity as it was transitioning into commercial applications.

Presentation A11.D FAA Cybersecurity R&D Plan

Presenter *John Lapointe and Chuck Agava*

Summary: At the subcommittees' request, Mr. John Lapointe commenced the briefing by providing an update on the FAA Cybersecurity R&D Plan based on approach, requirements, funding profile, and gaps. The FAA Extension, Safety, and Security Act of 2016, section 2111 authorizes five components, such as the Comprehensive and Strategic Aviation Framework, Update on Cybersecurity Implementation Progress, Cybersecurity Threat Model, National Institute of Standards and technology Information security standards, and cybersecurity research and development plan. Mr. Chuck

Agava pointed out that the program did their best to map the requirements to the research areas. The presenters also discussed the funding profile of the Cybersecurity R&D Plan. One of the subcommittee members questioned if the program maintained a metric that showed whether a sufficient amount of research had been done on a requirement. The FAA clarified that some requirements come to a logical end, whereas others might be ongoing requirements based on the subject areas or the new oncoming programs. The subcommittee also recommended that the program work closely with their customer or sponsor to fulfill the research requirement for a desired output. The subcommittee also inquired if the program had considered requirements on an airplane. The members also recommended that the program reach out to the American Institute of Aeronautics and Astronautics (AIAA), and other industry companies like GE, NASA, etc.

Presentation Day 2 Overview and Recap

Presenter *Leo Prusak*

Discussion – The next REDAC session for spring 2018 will be held March 27-29, and the next fall session will be September 12-13, 2018. The subcommittee members expressed that the Human Factor briefings were not necessary at the NAS OPS subcommittee. The subcommittee highlighted the positive outcomes from the R&D work being accomplished by WTIC. The subcommittee informed the DFO that JetBlue performed a review of the FAA Cybersecurity R&D Plan and the comments would be shared with the FAA POCs for the Cybersecurity R&D plan. The DFO informed the subcommittee that the FAA response for RIRP Finding and Recommendations (F&Rs) was almost final. The subcommittee members were advised that if they deemed the FAA response to be unsatisfactory and the outcome of their review of additional documentation provided by the RIRP program office to be insufficient, then another F&R could be opened at the next REDAC meeting.

PRIOR ACTION ITEMS

August 2015 NAS Ops Meeting

<u>Action</u>	<u>Assigned</u>	<u>Status</u>
1) Inspect the FAA process to move weather concepts from requirements to implementation. Determine if the required elements are in place and if there are disconnects. Consider logistic and level of participation of members on the Requirements Management Board. Provide recommendations to the subcommittee	M. Weber J. Kuchar	Open
2)		

March 2016 NAS Ops Meeting

<u>Action</u>	<u>Assigned</u>	<u>Status</u>
1) a. Deep Dive – Demonstrate Aviation Wx Products. Address NextGen integration (Steve Abelman)	M. Molz	Closed 3/22/17

August 2016 NAS Ops Meeting

<u>Action</u>	<u>Assigned</u>	<u>Status</u>
1) Provide the subcommittee a copy of the UAS Implementation plan (when available)	Ann Cihon	Open

March 2017 NAS Ops Meeting

<u>Action</u>	<u>Assigned</u>	<u>Status</u>
1) Provide subcommittee feedback to S. Yak on NARP Redesign	D. Zellwegger	Closed 9/12/17
2) Set up a telecom to brief SMDP results to subcommittee	M. Molz	Open
3) Deep Dive - UAS Topics <ul style="list-style-type: none"> a. UAS in the NAS & UTM/DAC interaction with RTTs (S. Bradford/J.Cavolowsky) b. Pathfinder Program Updates/Organizational Mapping (S. Bradford) c. UAS Weather Products (S. Abelman) (30 minutes) 	M. Molz	Closed 9/12/17
4) RIRP Update – Progress of RIRP benefits analysis (B. Marple)	M. Molz	Closed 9/12/17

CURRENT ACTION ITEMS

September 2017 NAS Ops Meeting

<u>Action</u>	<u>Assigned</u>	<u>Status</u>
1) RIRP will provide a briefing to the subcommittee on the following: <ul style="list-style-type: none">• Detailed risk reduction analysis work• A determination of which technology investments could meet the operational need.	Ben Marple/James Fee	Open
2) Commercial Space Integration will provide a concept of operations briefing highlighting the following: <ul style="list-style-type: none">• Budget allocations• Detail funding that exists to conduct research to support the predicted space launches without significant impact to the NAS	Paul Wilde	Open
3) New ATM Requirements will provide detailed briefing on the following, at the Spring REDAC <ul style="list-style-type: none">• Budget allocation• A description of how each New ATM Requirements activity is quantified• Information on how activities related to Datacomm and NAS Systems in a cloud environment are coordinated• Detail on the vision for future NAS information systems	Francisco Bermudez	Open
4) Operations Concept Development & Infrastructure (ATDP) will provide details to the subcommittee on Operational Concept work <ul style="list-style-type: none">• Provide additional detail on next Operations Concept Development.• Review the scope of Operational Concept research• Overview of the processes that has been defined to structure and align concept definition and validation• Description of how existing NextGen processes are being used to inform research	Maureen Keegan	Open

FINDINGS AND RECOMMENDATIONS

August 2016 NAS Ops Meeting

Findings	Status
1) Unmanned Aircraft System (UAS) - Continued momentum, leverage UAS leadership structure (Fall_2016_1)	Closed

March 2017 NAS Ops Meeting

Findings	Status
1) Operations Concept Validation – Programmatic Risk Mitigation (Spring_2017_1)	Open – Pending official FAA Response
2) Runway Incursion Reduction Program Benefits Pool Estimation (Spring_2017_2)	Open – Pending official FAA Response

September 2017 NAS Ops Meeting

Findings	Status
1) Commercial Space Transportation (CST) (Fall_2017_1)	Open
2) Unmanned Aircraft System (UAS) Pathfinder Areas 1, 2, and 3 (Fall_2017_2)	Open

ATTENDEES

Subcommittee Members in Attendance:

Leo Prusak (Chairman)	Emily Stelzer
Francisco Bermudez (DFO)	Jim Kuchar
Joe Bertapelle	Andres Zellweger
John Cavolowsky	Bruce Holmes

Others in Attendance:

Shelley Yak	Maureen Keegan
Chinita Roundtree-Coleman	Maureen Molz
Mike Gallivan	Chuck Agava
Frank Wondolowski	John La Pointe
Tim Evans	Bill Kaliardos
Ben Marple	Paul Wilde
Dan Herschler	James Fee
Gary Pokodner	Starr McGettigan
Amit Choudhri	
Arthur Orton	
Lindsay Digneo	
Gregory Pray	
Sadaf Alam	
Joseph Ivkovic	
Ryan Blondino	

AGENDA

Tuesday, September 12th (Engility Offices: Anacostia B Conference Room)

Time	Topic	Presenter(s)
0800-0815	Welcome/Overview	Leo Prusak Francisco Bermudez
0815-0845	Review of REDAC Recommendations, Responses, and Open Actions	Leo Prusak
0845-0915	Budget Briefing	Mike Gallivan
0915-0945	1A09D NextGen – New Air Traffic Management Requirements	Francisco Bermudez
0945-1015	NAC Initiatives/ESTG Report/NEC Work Status Update	Subcommittee
1015-1030	Break	
1030-1100	Deep Dive – UAS Topics <ul style="list-style-type: none"> • Pathfinder Program Updates 	Rob Pappas
1100-1130	Deep Dive - UAS Topics <ul style="list-style-type: none"> • UAS Weather - Gap Analysis 	Starr McGettigan
1130-1200	A11.K Aviation Weather Research Program (AWRP)	Danny Sims
1200-1245	Lunch	
1245-1315	Commercial Space Transportation (CST)	Dorothy Reimold/Paul Wilde
1315-1345	1A01C Operations Concept Validation & Infrastructure (ATDP)	Maureen Keegan
1345-1415	1A01A Runway Incursion Reduction (RIRP) Update <ul style="list-style-type: none"> • Progress of RIRP benefits analysis 	Ben Marple
1415-1445	Subcommittee Discussion	Subcommittee
1445-1500	Break	
1500-1530	Out brief from the 2017 USA-EU ATM R&D Seminar	Subcommittee
1530-1630	Implications to NAS Management from recent Industry developments <ul style="list-style-type: none"> • “horizon” issues about which the FAA RE&D community will want to be thinking strategically. 	Subcommittee
1800	Dinner – location TBD	

Wednesday, September 13th (Engility Offices: Anacostia B Conference Room)

Time	Topic	Presenter(s)
0800-0830	Review Findings and Recommendations / New Actions	Leo Prusak
0830-0900	1A07A0 NextGen ATC/Tech Ops Human Factors	Bill Kaliardos
0900-0930	A11.i Air Traffic Control/Technical Operations Human Factors	Dan Herschler
0930-0945	Break	
0945-1015	A12.e NextGen – Weather Technology in the Cockpit (WITC)	Gary Pokodner
1015-1115	Cybersecurity Plan (v1.0) – Subcommittee Recommendations	John Lapointe/ Chuck Agava
1115-1215	Subcommittee Discussion & Closing	Subcommittee Leo Prusak