**REDAC HOMEWORK ASSIGNMENT**

**29 July 2014**

**Three Hot Topics:**

1. Pilot Workforce, Shortage and Training Bandwidth
2. Constraint-Based, Trajectory Based Operations (TBO)
3. Commercial Off the Shelf ATM/TFM Solutions

**Pilot Workforce, Shortage and Training Bandwidth**

The current pilot shortage and airframe orders on the books mean that the future pilot shortage will likely be as impacting or even more impacting than it is today. The point is that the continued traditional role pilots have played is evolving but the requirements placed upon pilot, which are already significant, are now required of an increasingly inexperienced workforce. Should the requirements for NextGen efficiencies put even more pressures on the role pilots play in the future NextGen system? Will the Pilot have the bandwidth to respond adequately in the future. Can the cost and time available for training be absorbed with the current approach?

These difficult questions beg more radical potential research solutions and approaches such as commercial UAS operations, Single Pilot Operations (SPO) and other alternative approaches to possibly ease the pressures brought to bear on demand for pilots. There is also the possibility that a solution in Pilot Training and Qualification could be found to address the shortage. However, even if the pilot shortage pressures were to subside, will there be sufficient bandwidth to refocus well trained pilots on the ATM efficiencies?

Any approach to NextGen research should keep these pilot costs and constraints in mind and consider not only pilot-controller-based solutions but more automation, CATM and AOC based solutions that can relieve the pilot centric requirements that the traditional (pilot-controller) approaches to NextGen impose upon them. A research challenge here is that the automation needs to accomplish more without imposing additional, new, training requirements on pilots. This is not always as easy or simple as it first appears and therefore the risks of performance shortfalls should be considered fully in the research. There are many examples.

**Constraint Based (Re)Flight Planning and TBO**

Most Trajectory Based Operations (TBO) concepts in NextGen attempt to squeeze new (actually now quite old) technologies into traditional and existing paradigms of Pilot, Controller and occasionally Dispatcher roles and responsibilities. These technology-based approaches have generally been cut short of results by the difficulties with system integration and aircraft equipage, adding large costs, risk and high complexities to the National Airspace System (NAS). Best Equipped Best Served (BEBS) and BIBS (Informed) are good examples of logical constructs to reward good behaviors in the equipage challenge but implementation in real Air Traffic procedures has proven difficult at best. Industry stakeholders are reluctant to retrofit aircraft and mixed equipage environments make ATC Procedures changes onerous and undesirable.

A more basic and simplified approach to provide bottom line benefits to industry at less cost is called for and entirely do-able if some basic research could be done to illustrate and support the benefits and feasibility. The current ATC Preferred Routes are “adapted” in the Host (Now ERAM) to satisfy static perceptions of what controllers want, not what operators desire which would be User Preferred Trajectories (UPT’s). These static adaptations become non-linear costs when they force flights into weather during convective weather activity. By allowing operators who already create optimized trajectories, to file conflict-free trajectories (enabled by constraint based flight planning) and adjust them within business related priorities, the entire NAS could be made more efficient without compromise in safety. In fact, the failure to allow operators to optimize across ATC constraints in the first place (something the flight planning systems do for other constraints) adds enormous complexity and unnecessary burdens to the ATO workforce.

Some ERAM capabilities to support trajectory negotiations with AOC’s and the Flight Deck and some basic DataComm capabilities would further enhance this capability but the vast majority of these are NOT required contrary to many perceptions. What is required is to move CACR/CTOP from an ANSP centric approach to an operator centric approach in their next Phases. The foundations are already established. An honest and independent research assessment of the potential for satisfying the stakeholders in a much simplified risk-based approach, with greater access and flexibility provided by UPT’s is a critically important strategic research topic.

**Commercial Off-The-Shelf ATM (COTS) Solutions**

The rigorous and substantial processes of FAA procurement are making it almost impossible for the FAA’s ATO to keep up with industry developments and capabilities which are needed for modernization and NextGen. Major program improvements are already reaching technological obsolescence when the RFP is issued. IOC and full deployment generally come years later. This causes improvements in ATM and TFM to trail the industry by up to a decade (Please see RTCA TF5). It is further implied that research efforts and plans of the FAA are often marginalized by the latency with which such research discoveries mature into deployable capability.

If leaders and managers of the ATO can be empowered to make limited, surgical and focused investments more easily, then the industry will benefit in the near-term directly from the benefits which will accrue to FAA ATO and other areas of the FAA. Major programs can still be the FAA’s primary means of infrastructure modernization and NextGen implementation but the combination and synergies of COTS plus the traditional FAA programs would be far more efficient. In this fashion the results of effective research efforts and programs will have “somewhere to go” or an effective path to implementation in a more realistic timeframe taking greater advantage of the insights gained from the research and the existing risk-based approaches employed by industry.

Strategically, the FAA should first consider and address the challenges of its own abilities to implement the right discoveries before the research plans reveal them. There is much that the industry has already finished and far more that they can do for and on behalf of the FAA if rules for deployment of COTS solutions are made more flexible and accommodating of industry developments and opportunities. This can include fully integrated capabilities contrary to common belief.