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Recommendations for Focus in the CSS-FD Program

A Report of the Tactical Operations Committee in Response to Tasking from the Federal Aviation Administration

December 2017

Recommendations for Focus in the CSS-FD Program

Contents

Executive Summary

The Common Support Services – Flight Data (CSS-FD) Task Group of the Tactical Operations Committee (TOC) examined capabilities envisioned in the CSS-FD Program that enable the ICAO concept of Flight and Flow Information for a Collaborative Environment (FF-ICE). The concept envisions an environment for flight planning where all relevant information is shared amongst stakeholders, allowing stakeholders to make collaborative decisions based on consistent information. Implementation of CSS-FD will require investment from both the FAA and industry. This report provides TOC feedback on the value and risks associated with CSS-FD in support of a 2018 Investment Analysis Readiness Decision (IARD).

First and foremost, critical to success of CSS-FD is the alignment of investment decision-making between FAA and industry. Aviation history includes multiple examples of either the FAA or industry investing without corresponding investment from the other party. In an effort not to repeat mistakes of the past, the CSS-FD program is implored to develop its capabilities in a sequence that will motivate industry investment.

To that end, this report provides recommendations of specific system constraints that should be prioritized in the evolution of CSS-FD. Certain constraints are recommended for initial focus, including airspace constraints, ATC assigned routes, certain Traffic Management Initiatives and runway status information. CSS-FD envisions providing additional constraint information beyond these and the group recommends these be delivered as well.

This report was developed with expertise across different operator groups (Large commercial, Business Aviation, General Aviation), different operating disciplines (Dispatch, Flight Deck), and flight planning vendors. The work was conducted quickly and all constraint evaluation was qualitative in nature based on subject matter expertise. As follow-on to this effort, this report recommends FAA continue collaborative analysis to further quantify the value of constraint information as well as to build out a concept of use of CSS-FD.

Additional CSS-FD components received support: provision of constraint information through CSS-FD and moving away from prescriptive reroutes enables operators to build optimal routes for their individual operations. This is a long sought objective in the operator community. Additionally, expanding the allowable time of electronic flight planning collaboration up to wheels off will deliver a significant enhancement to the current highly manual reroute process today. Finally, operators are supportive of providing increased flight planning information should this data enhance the trajectory models used in operational decision making. Industry seeks greater detail on what operational data provides the greatest operational value.

Ultimately, implementation of CSS-FD will carry with it a series of risks that require mitigation. These risks are delineated in the report and include aligning investment decisions and timelines

between FAA and industry, accuracy of the shared information used for planning, and clarity on the use and dissemination of sensitive information.

Introduction

The International Civil Aviation Organization (ICAO) has been developing a concept for Flight and Flow Information for a Collaborative Environment (FF-ICE) as a component of the transition to Trajectory Based Operations (TBO). This concept envisions using standardized information exchange models and modern service oriented interfaces to set up an environment for planning flights where all relevant information is shared amongst stakeholders, allowing stakeholders to make collaborative decisions based on consistent information. This environment will be available for service providers to implement, but will not be required: operators and service providers can decide whether to participate. Non-participants will continue to file flight plans using the existing ATS messages over AFTN.

The FAA has established the Common Support Services – Flight Data (CSS-FD) program which is planning to provide a standards-based flight planning environment consistent with the FF-ICE concept. Implementation of CSS-FD will require investment from the FAA and industry to enable increased information sharing, collaboration and new automation and work flows.

The CSS-FD Program has an Investment Analysis Readiness Decision (IARD) planned for first quarter of CY2018 and is interested in understanding what types of flight plan impacting system constraints and related information are of the highest priority to motivate industry investment in automation to support FF-ICE. To further understand this, the FAA requested the RTCA Tactical Operations Committee (TOC) to respond to the following task (see Appendix A for the full tasking letter):

Task 1: Assist the CSS-FD team in establishing areas of focus for the investment, by identifying the features of the concept that will provide the most operational benefit, e.g.

a) Knowing which ATM constraints will affect a flight
b) Being able to provide additional details on the expected flight trajectory that will allow more accurate FAA assessment of the constraints
c) Being able to create an operator-optimized plan in response to a TMI rather than simply fly a TFM-assigned reroute
d) Being able to electronically coordinate changes to a flight plan after the normal lock-out time

Task 2: Assist the CSS-FD team in identifying areas of risk and operator constraints that could impact successful implementation of the early collaborative planning envisioned in the concept.

The aviation industry understands and appreciates that information sharing and exchange of data is increasing worldwide. Recent examples of industry sharing 11 operational data elements in the United States and data exchange for London Heathrow operations highlight the fact that there are real-world examples of implementing and expanding data exchange that improve operations today and move towards TBO. Additionally, the Flight Information Exchange Model (FIXM) is well structured to enable increased exchange. However, operator systems and databases will require extensive refactoring to migrate to these new data and exchange models, and this will remain a significant challenge for the industry in the years ahead.

Methodology

The TOC established the CSS-FD Task Group as a working group of the full Committee to consider the task request and develop a draft recommendation report. The result of this Task Group's work is this report. The Task Group included expertise from different stakeholders in the National Airspace System (NAS), including operators (General Aviation, Business Aviation, Commercial Aviation), labor groups, flight planning vendors as well as Subject Matter Experts from the FAA (see Appendix B for Task Group membership). The group held multiple briefings and discussions to identify the most valuable information in CSS-FD and risks as well as to develop this written report.

This report is focused on FF-ICE Phase 1 which is flight planning before departure. Findings and recommendations contained here are relevant to planning and collaboration before 'wheels off' for an aircraft.[1]

The FAA/Industry Investment Challenge

Finding 1.	Alignment of investment decision-making between FAA and industry is the underlying driver of success for CSS-FD.

The underlying challenge to CSS-FD is to align timing of investment between the FAA and industry such that all stakeholders can make investment decisions with a higher level of confidence in achieving the anticipated benefit from the investment. Being sensitive to this challenge, the FAA would like to ensure that if it invests in implementation of the CSS-FD Program that flight planning vendors and flight operators will make corresponding investments to utilize the capabilities. Similarly, if vendors and operators invest in new automation and workflows to leverage CSS-FD, they would like to ensure that FAA provides the expected capabilities that will deliver the highest return on investment. Both FAA and industry have

[1] Note that the scope of Eurocontrol's FF-ICE Phase 1 activity ends at filing of the flight plan.

previous experiences in which it made investments in new capabilities without a corresponding investment from other stakeholders, thereby significantly limiting the return on investment. The intent of this report is to help identify and prioritize the set of capabilities the Program should focus on such that FAA, vendors and operators all move to quickly invest with some level of certainty that the required components for payback and success will be made available.

Capabilities Considered in CSS-FD

CSS-FD will provide opportunity for TFM, ATC and the operator to all work from the same set of applicable constraints. If operators employ the system, CSS-FD will assist the FAA in receiving earlier submission of preliminary planning information from operators and a greater understanding of the anticipated demand on the system. Correspondingly, operators will be provided with valuable feedback on flights, which in turn enables new capabilities focused on easing the coordination and negotiation of changes between operators and the FAA.

This group considered the following key capabilities proposed in CSS-FD:

- Flight plan feedback on applicable Air Traffic Management constraints for trial, preliminary and filed flight plans
- Monitoring service for changes to constraints after initial submission
- Capability for operators to communicate more information about their intended flight, likely enhancing trajectory prediction and negotiation.
- Improved capability to update flight plans after current lockout time up to “wheels up” or when the flight is activated in the NAS System.

In addition to these capabilities, CSS-FD also includes a more flexible data exchange to enable improved collaborative flight planning. This Task Group did not focus on data exchange but recognizes that other industry working groups that are more focused on information and technology will need to evaluate the merits and risks of future changes and expansion of current, agreed to levels of data exchange.

Response to Tasking Requests

The sections below provide responses to the five task elements from the FAA’s task request (included in Appendix A). The five specific questions that are addressed are:

1. Highest Value Flight Plan Feedback Data (Task 1a)
2. Additional Operator Data to the FAA (Task 1b)
3. Value of Operator Optimized Routes (Task 1c)
4. Value of Route Adjustment After Lockout Time (Task 1d)
5. Risks to Successful Implementation of CSS-FD (Task 2)

Highest Value Flight Plan Feedback Data

This section is focused on the value of receiving feedback on various ATM constraints that impact a flight plan. The information here is intended to assist the CSS-FD team in focusing on the feedback that provides the most operational benefit.

The Task Group reviewed a list of potential types of constraints provided by the FAA (See Appendix C for constraint list provided by FAA to the Task Group).

Recommendation 1.	**CSS-FD should place initial focus on provision of flight plan feedback related to airspace constraints, ATC constraints and routes, certain Traffic Management Initiatives (AFPs, MITs) and runway status information.**

To help establish priorities, the group used the following guiding principles when evaluating the value of feedback on each constraint type:

- Identify feedback that would directly impact the flight planning process and the route that is filed
- Identify feedback that would have the greatest value in flight planning decision making and encourage early investment
- Do not consider CSS-FD constraints solely as a new method to acquire flight planning data that vendors or operators already have; instead, focus on the timely notification of constraints impacting each flight that may change flight plans. Even though some constraint information may be available to operators today, these are still important to receive through CSS-FD since they are provided at the time of planning.
- Identify feedback that is new data that vendors/operators cannot currently access.
- Given this tasking and associated report were developed on an expedited timeframe, the group primarily utilized qualitative assessment and subject matter expertise.
- A scale of High (H), Medium (M), and Low (L) were used to prioritize the constraint types. Some constraints were prioritized as M/H if they were considered between Medium and High priority. The constraints identified for initial focus in CSS-FD are the High and Medium/High priority constraints.

The group recommends that the high and medium/high priority constraints noted below be the initial focus of CSS-FD.

Table 1 Constraints for Initial Focus in CSS-FD

Constraint Category	Priority	Constraint Detail
Airspace Constraints	H	Temporary Flight Restrictions
	H	Active SUA/ATCAA

		Inclusive of scheduled to be active, actual activation/deactivation, NOTAM activated SUA and any other dynamic information relative to when a flight is projected to reach the airspace. This is dynamic information and operators are interested to know if airspace will be hot or cold when aircraft reaches a SUA boundary.
	H	Closed and impacted routes *Examples are routes unavailable due to interference, ATC zero, airway NOTAM'd out of service, change in MEA, unavailable transition, etc.*
	H	Prohibited Areas
ATC Constraints and Routes	H	ATC assigned route (automated or manual) ERAM auto-route or ATC Preferred Route
	H	TFM assigned route (Route Advisory-Required)
	H	Altitude or speed crossing restriction from ATC SOP/LOA
Traffic Management Initiatives	M/H	Airspace Flow Program *Larger operators handle at network level; smaller operators may derive greater value from this. Feedback enables operators to confirm that a route-out removes a flight from an AFP as intended.*
	M/H	Miles-in-Trail or Minutes-in-Trail Restrictions *Operators interested in impact of MIT (delay, miles, etc.); knowing MIT impact(s) to a route may adjust routing*
Runway Status	M/H	Closed Runway *Runway changes can have an impact on SID/STAR and impact route*
	M/H	Runway configuration at departure/destination *May impact SID/STAR and impact route*

Recommendation 2. CSS-FD should also deliver feedback on the full constraint set.

The intent of the group's constraint prioritization is to set an order of highest perceived return that may be used to influence development strategy. While those constraints noted as high priority in recommendation 1 are most beneficial in terms of providing initial return on investment, they should not be considered the only constraints required for a successful CSS-FD deployment. The remaining medium and lower priority constraints are still very important and must be included in CSS-FD development and implementation plans as well.

The following table lists the remaining constraints along with the identified medium or low ranking, and were established using the same guiding principles used during identification of the high priority items in recommendation 1.

Table 2 Constraints for Secondary Focus in CSS-FD

Constraint Category	Priority	Constraint Detail
Traffic Management Constraints		***Delays/ Reroutes***
	M	Controlled Departure Time
	L	Flow Evaluation Area (FEA) or Flow Constrained Area (FCA)
	L	TFM Advisory— Route Advisory--Recommended
	L	TFM Advisory— Route Advisory--Planned
	L	TFM Advisory— Route Advisory--FYI
		Traffic Management Initiatives (TMIs)
	M	Ground Delay Program
	L	Ground Stop
	L	Collaborative Trajectory Options Program
	M	Fix Constraints
	M	Metering Restrictions
NAS Resource Constraints – Outages	M	Navigation Aid (NAVAID)
	L	Radar
	L	Closed Taxiway
	L	Instrument Landing System (ILS)
	M	Global Positioning System (GPS)
Resource Constraints due to Meteorological Conditions – Airport / Route	L	Deicing operations
	M	Standard Instrument Departure (SID)/Standard Terminal Arrival Route (STAR) status

Recommendation 3. The FAA and industry should conduct collaborative analysis on the impacts of flight plan feedback to further inform future investment decisions.

While vendors and operators see value in the constraints referenced in Recommendations 1 and 2, a deeper analysis is required to conduct a proper investment evaluation of having this feedback. The above priorities were established within a limited timeframe with a limited set of resources, and we feel are a solid starting point. Further analysis may change the priorities slightly based on the findings of an investment analysis. The group suggests that additional FAA and industry analysis is warranted to further quantify the value of feedback on these key constraints as well as determine how to operationalize the concept of operations into a concept of use. Multiple industry venues such as the TOC, Collaborative Decision Making or others may be appropriate for such follow-on work.

Additional Operator Data to the FAA

Recommendation 4.	**The FAA should identify which operator data elements provide the greatest operational benefits by improving trajectory modeling and engage the vendor/operator community to evaluate feasibility to submit such information.**

Operators have significant detail available related to their intended flight plan, as well as the capabilities and limitations of the assigned aircraft that may impact the route. Hence, there is opportunity for operators to provide additional detail on their flight plans to the FAA to enhance the ATC system's understanding and predictability of each flight trajectory. However, depending on the specific data elements involved, gathering and transmitting data may be time consuming and costly for the operator community.

Vendors and operators note that data already generated in flight planning would be relatively simple to transmit to the FAA. Some potentially valuable data in this category include:

- Aircraft Top of Climb, Top of Descent, and planned runway transitions
- Detailed Flight time Information: Given operators' focus on managing the times associated with their flights, detailed information about intended timing of each flight provided via CSS-FD could prove valuable to Time Based Flow Management (TBFM) activities
- Aircraft performance related information: Additional operator data on the limitations of a specific aircraft operating a flight segment. Due to variations in aircraft performance, even those in the same fleet within an airline, inclusion of this data could enhance trajectory models.

Though industry could provide more data to the FAA, industry would only do so if it was clear that the FAA would leverage the new information in its trajectory modeling, and in certain cases may require that the data be restricted from public dissemination. Today, operators provide planned en route altitude information that is not used by the FAA in its models.

Additionally, while operators could provide certain information to the FAA, it is not clear which data elements are the most important to improving the accuracy of trajectory modeling. Given the resources required to extract and transmit data, all stakeholders would be well served by identification of which data is most impactful to trajectory modeling in operational systems.

Should operators ultimately provide additional data to the FAA for improving trajectory models and operations, changes to FIXM may be required. Such changes take significant effort and FAA and industry would require close collaboration to integrate any new data into FIXM.

Value of Operator Optimized Routes

Finding 2.	**CSS-FD constraint feedback is valuable to operators to optimize individual flight plans, as well as make flight planning decisions that optimize an operator's network.**

CSS-FD is anticipated to provide constraint information that enables operators to more effectively plan their own optimal routes. Operators are supportive of the FAA providing constraint information instead of prescriptive required routes.

For an operator flying one or a small number of flights, "optimal" routes may be shortest time or least fuel, and each operator may have his or her own preference for what drives optimality. The constraint information will equip the operator to plan according to that individual definition.

For large network airlines, constraint information and less prescriptive reroutes are also valuable. These operators are expected to utilize the information to build individual flight plans that enhance network operations. Achieving network optimality will not necessarily equate to optimality of each individual flight. For example, large airlines may be willing to trade off the fuel burn of an individual flight in exchange for maintaining system integrity for the network as a whole. The receipt of early and continual constraint based feedback is expected to improve planning of the airline's network operations with greater predictability earlier in the planning process.

Value of Route Adjustment After Lockout Time

Finding 3.	**The ability for operators to submit a route adjustment after lockout time has high operational value, in terms of safety and efficiency.**

Today, when operational conditions require new routes, re-planning routes after lockout time is a significant resource drain and logistical challenge for both operators and the FAA. Tedious manual processes, often conducted via phone and include the manual typing of full route strings, are required between traffic managers and dispatchers. This results in more errors, minimal flexibility, and decreased usage. The CSS-FD concept shifts some of this work to the Dispatcher to propose changes through new automation. This reduces the current bottleneck of Traffic Management workload in rerouting, improves accuracy, and speeds up decision making on the execution of reroutes.

Additionally, in reroute scenarios there are situations where multiple strips are printed in a facility on the same flight number. This can result in the inconsistent understanding of an aircraft's intended route of flight between the pilot and controller. Multiple strips is a known safety issue[2] today in the NAS, and the CSS-FD capabilities should help to reduce this issue.

Risks to Successful Implementation of CSS-FD

The following risks have been identified for successful implementation of CSS-FD:

Risk	Detail
Cost of investment (automation, data, workflow)	To participate in CSS-FD will require changes to automation and dispatcher workflow. These changes will require investment and the value of CSS-FD will need to outweigh such costs. Additionally, the prevalence of legacy automation systems and data infrastructure will challenge the investment to upgrade to FIXM and a collaborative planning environment. Robust analysis on the impacts of CSS-FD to both FAA and operators will help to strengthen the business case for investment by all parties and ensure a sufficient level of participation.
Linkage to multiple other systems/concepts	CSS-FD value is related and/or dependent upon successful implementation of other FAA Programs. Clear mapping of dependencies on other systems or Programs will be required to ensure stakeholder confidence and a strong value proposition in favor of its implementation.
Additional automation required for amendments to flight plan after lockout	CSS-FD will require development of a set of automation and procedures to enable changes to flight plans after lockout time. Until paper flight strips are replaced with electronic flight data, amendments after the lockout period will still require some manual coordination.
Accuracy of constraint information	Some of the high value constraint information is dynamic in nature. If these data sources are reliable and stable they can be utilized and deliver operational value. However, if they are not reliable this could deteriorate confidence in the overall feedback provided by CSS-FD.

[2] A flight plan can not be modified by the operator within a certain period before proposed departure (the period varies by facility but is typically 45 minutes). Because of this, a common practice is to call the relevant ATC facility and ask to have the plan removed, followed by a sending of the modified plan. When the first plan is not removed first, two flight plans for that flight end up in the system. Depending on timing, strip printing and posting, ATC may not be aware of the second flight plan when delivering the pre-departure clearance and could issue "cleared as filed". If ATC activates the first plan and the pilot is on the second plan, an unexpected turn can result. These incidents are infrequent but do occur. Traditional pre-departure clearance (not DCL) also delivers a partial route and could be ambiguous as to which plan is being cleared. Examples of recent incidents include:

- Confusion over multiple amendments and then a replacement flight plan (after the clearance was delivered) resulted in a pilot flying a route other cleared by ATC, which took the flight directly into a Warning Area.
- A late MEL issue made a flight ineligible for the NAT tracks, and they sent a replacement flight plan that avoided the tracks. However they were cleared on the original flight plan and unexpectedly turned in Oceanic airspace.

Accuracy of trajectory models	The NAS is a dynamic system and trajectories change. There is uncertainty as to whether models will be precise enough for dynamic feedback to be consistently useful.
Program funding	FAA budget challenges could impact the program. If funding challenges or other external factors change the Program, impact the implementation timeline or reduce its planned capabilities, this could negatively impact operator perceived benefit and investment decisions.
Collaboration	Close collaboration is required between FAA and industry throughout the process of concept development and implementation of CSS-FD. If this collaboration is not maintained, the Program risks divergence between the FAA and industry and, ultimately, a reduction in benefits due to limited participation.
Use of operator provided data	There is concern about the utilization of data provided in planning. Operators are concerned that data provided while exploring 'what if' scenarios through preliminary plans could be utilized to make system management decisions or be prematurely released to the public. Clear policies on data usage will be required to address operator concerns.
Release of operator provided data	Some operator data could be sensitive and operators may not wish for it to be released to the public. Clear policies on data sharing will be required.

Summary of Potential Value from CSS-FD

The operator community identified the following key areas of potential value from CSS-FD:

Benefit Area	Detail
More predictable operations	With improved operator provided information, trajectory models and flight plan feedback (including access to new information like SUA status and LOA/SOP), system knowledge of trajectory and times should be improved.
Possible reduction in fuel carried and/or increase in payload	Improved information should more precisely align planned and actual fuel required. Over time, fuel loads could be more accurately planned thereby reducing actual fuel burn and allowing for optimized (increased) payload to be carried.
Reduction in workload to Dispatchers	As a result of both (a) monitoring service post-submission that alerts based on change in constraint and (b) capability to electronically coordinate changes.
Improvements to network operations	With improved information sharing on constraints, operators will be better equipped to make better flight planning decisions for individual flights that support the network operation as a whole.

Appendix A: Tasking Letter

U.S. Department
of Transportation
**Federal Aviation
Administration**

AUG 2 1 2017

Ms. Margaret Jenny
President
RTCA, Inc.
1150 15th Street NW
Washington, DC 20036

Dear Ms. Jenny:

The International Civil Aviation Organization (ICAO) has been developing a concept for Flight and Flow Information for a Collaborative Environment (FF-ICE). This concept envisions using standardized information exchange models and modern service oriented interfaces to set up an environment for planning flights where all relevant information is shared amongst stakeholders, allowing stakeholders to make collaborative decisions based on consistent information. This environment will be available for service providers to implement, but will not be required: operators and service providers can decide whether to participate. Non-participants will continue to file flight plans using the existing ATS messages over AFTN.

The FAA has established the Common Support Services- Flight Data (CSS-FD) program to provide a standards-based flight planning environment consistent with the FF-ICE concept.

To ensure successful delivery of NextGen operational improvements, the FAA requests that the Tactical Operations Committee (TOC) use their broad expertise within the air traffic management community to help refine and/or validate the goals and approach to the flight planning service as described in the tasks below.

Background:
CSS-FD will provide a flight planning service that allows an operator to:

1) Convey more information to the FAA about their intended flight than is currently possible (allowing more accurate assessment of the plan with respect to constraints);
2) Obtain feedback from the FAA indicating the Air Traffic Management constraints applicable to a submitted flight; and
3) Use modern XML and web services to collaboratively plan with TFM and ATC according to the emerging global FF-ICE standards.

CSS-FD will provide opportunity for TFM, ATC, and the operator to all work from the same set of applicable constraints. This will assist the FAA in assessing the flight using all relevant information from the operator, if the operator employs the system.

The CSS-FD flight planning service will also provide opportunities to:

1) Simplify addressing of flight plans (all flight plans will be sent to one place); FAA will route to appropriate center(s).
2) Partially automate revisions to flight plans inside 45 minutes from departure, by allowing manual review of submitted changes and the ability to accept or defer the change depending on state of the flight. No phone call would be required for such changes.
3) Submit Trial (what-if) changes to see the effect of a reroute being considered.

The attached Concept of Operations describes the service as currently envisioned.

FAA request for TOC Tasking:

Task 1 – Assist the CSS-FD team in establishing areas of focus for the investment, by identifying the features of the concept that will provide the most operational benefit, e.g.

a) Knowing which ATM constraints will affect a flight, e.g.
    i. ERAM-assigned route
    ii. Traffic Management Initiatives
    iii. SAA penetration
    iv. TFR penetration
    v. NOTAMs
    vi. ATC SOP and LOA constraints
b) Being able to provide additional details on the expected flight trajectory that will allow more accurate FAA assessment of the constraints
c) Being able to create an operator-optimized plan in response to a TMI rather than simply fly a TFM-assigned reroute
d) Being able to electronically coordinate changes to a flight plan after the normal lock-out time

Task 2 – Assist the CSS-FD team in identifying areas of risk and operator constraints that could impact successful implementation of the early collaborative planning envisioned in the concept.

Fulfillment of this request by November, 2017 will provide the FAA with clearer insight into industry needs and constraints in support of the CSS-FD IARD planned for January 2018. The FAA will provide documentation and subject matter experts as needed to support this effort.

Sincerely,

Elizabeth L. Ray
Vice President, Mission Support Services
Air Traffic Organization

Appendix B: Participants in the CSS-FD Task Group

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