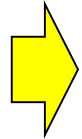
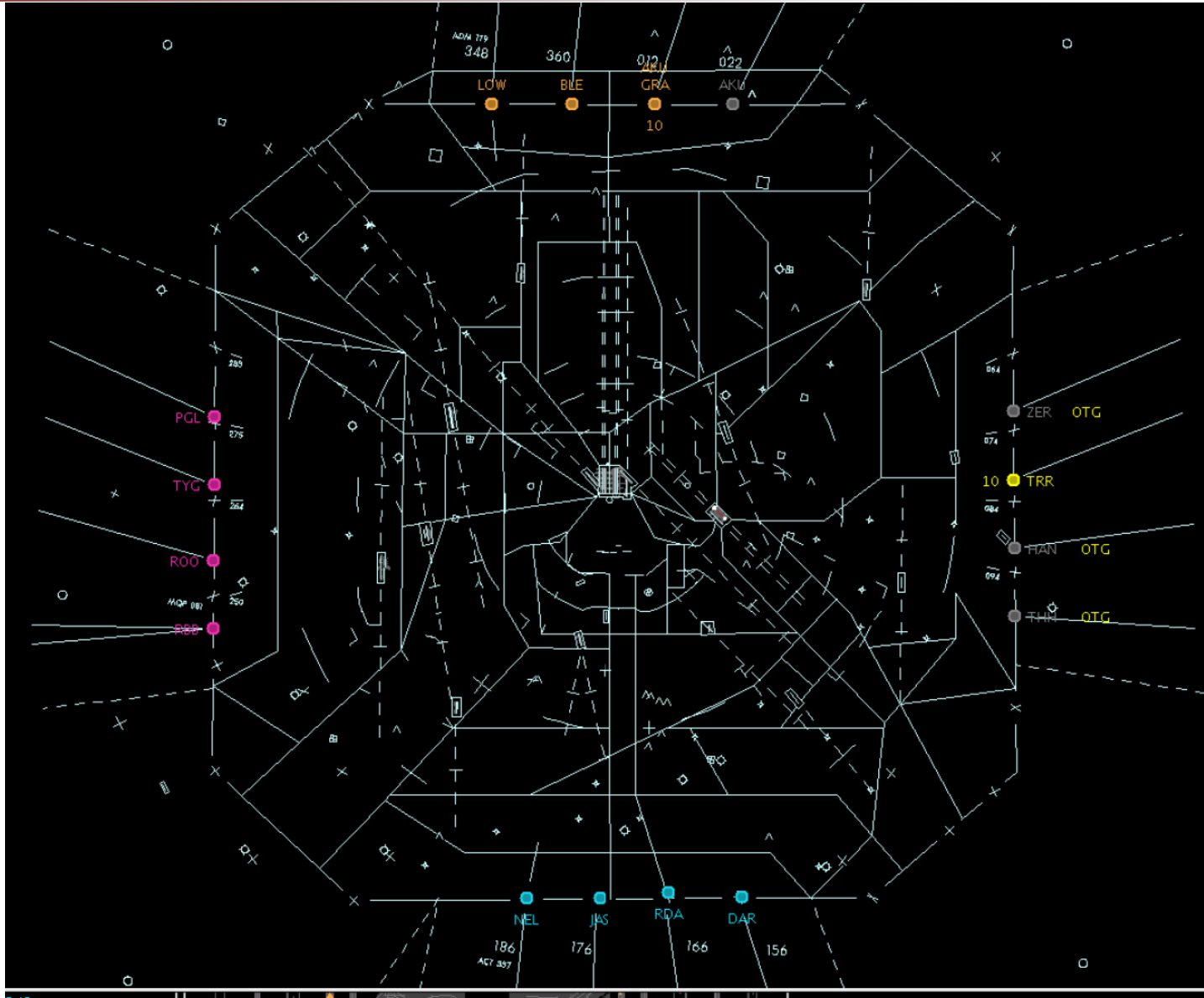


Stormy 19 Review Meeting

October 2nd, 2019



- Review of current TOS activation process
 - Maximizing benefits with current capability
- Summary of recent changes to the system
- Discuss potential future capabilities



Comparing ETOT with
Top ETOT - 9 to 52
minutes projected
savings

TOS Departure - Runway = DFW:17R,DFW:18L,DAL:13R; Eligibility State = Candidate

Flight ID	Rwy	Dest	Route of Flight	Dep Gate	EOBT ▲	ETOT	Top ETOT	Flight Status	TMI Info	Scratch Pad	Eligibility State	Coord State	Num TOS Cand	Num TOS Sub	Top CDR	Top Dep Gate	Top Total Delay Savings OFF	Top Rwy
		COS		NORTH	20/14:01	20/14:30	14:21	In_Queue			Candidate	Not Submitted	1			WEST	+9	
		RNO		WEST	20/14:04	20/14:37	14:21	Taxiing_AMA			Candidate	Not Submitted	1			NORTH	+16	
		MSY		EAST	20/14:07	20/14:47	14:24	Taxiing_AMA	10M FixClsd		Candidate	Not Submitted	1			SOUTH	+24	
		SLC		WEST	20/14:09	20/14:45	14:39	Pushback			Candidate	Not Submitted	1			NORTH	+6	
		SJC		WEST	20/14:14	20/14:52	14:39	Pushback			Candidate	Not Submitted	1			NORTH	+12	
		RDU		NORTH	20/14:32	20/15:23	14:49	Scheduled_Out	10M FixClsd		Candidate	Not Submitted	1			SOUTH	+34	
		MSY		EAST	20/14:52	20/15:20	15:04	Scheduled_Out	10M FixClsd		Candidate	Not Submitted	1			SOUTH	+15	
		DCA		EAST	20/15:13	20/15:39	15:30	Scheduled_Out	10M FixClsd		Candidate	Not Submitted	2			NORTH	+9	
		LGA		EAST	20/15:15	20/15:41	15:30	Scheduled_Out	10M FixClsd		Candidate	Not Submitted	2			NORTH	+12	
		MSY		EAST	20/15:20	20/16:04	15:34	Scheduled_Out	10M FixClsd		Candidate	Not Submitted	1			SOUTH	+30	
		GPT		EAST	20/15:25	20/16:09	15:38	Scheduled_Out	10M FixClsd		Candidate	Not Submitted	1			SOUTH	+31	
		LIT		EAST	20/15:30	20/16:21	16:01	Scheduled_Out	10M FixClsd		Candidate	Not Submitted	1			NORTH	+20	
		TLH		EAST	20/15:40	20/16:46	15:54	Scheduled_Out	10M FixClsd		Candidate	Not Submitted	1			SOUTH	+52	

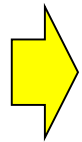


- Discussion on Continuing Use of TOS
- Field Facility Process to Activate TOS
- Suggested NASA Support to Leverage Opportunities
 - Follow Up Training
 - Periodic Review TELCON's/Meetings
 - Continue to Evaluate your Feedback
 - Periodic onsite support (as needed/requested)
 - Prepare For Stormy 2020

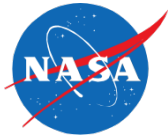


- Needs captured from previous discussions
 - Wind miles to compute flown time for given distances
 - Additional filters to list relevant flights with candidate routes
 - Aggregate delay metrics for TOS to understand the benefits to a group of flights
- Lessons Learned from using the system

- Review of current TOS activation process
 - Maximizing benefits with current capability



- Summary of recent changes to the system
- Discuss potential future capabilities



- August 2019
 - Added CPDL-DCL data
 - Added new features on Timeline to display “green T” (Approved TOS route)
 - Fixed to detect when reroutes were filed
 - Enhanced TOS table with multi-row headers, and added new filters for TMI flights (EDCT, APREQ, GS)
 - Modified method to compute delays and identify candidate flights
 - Modified computation of mileages based on flow direction at DAL & DFW
 - Fixed display of flow direction of CDR’s on map
 - Fixed TMI service to process cancelled restrictions and “chains” of restrictions
- September 2019
 - Addition of D10 airports (departures, arrivals, and internal) in terminal schedulers
 - Improvements to surface scheduler at DAL
 - Introduced Taxi Plan at DFW to improve predictive accuracy
 - Modified parsing of SWAP Entries in NTML
 - Fixed size issues with TOS tables
- Planned for October 28th
 - Introduction of Manual global filtering (TOS Reroute Availability Monitoring)
 - Manual exclusion of individual flight (right-click function)
 - TOS Exclusion state
 - Enhancement of MAP to show CDR route availability

SWA & AAL Flights	No TMI	MIT and/or Fix Closures	EDCT	APREQ	Total
Count of Flights	32134	4837	966 *	421 *	37551
% TMI (row)	85.6%	12.9%	2.6%	1.1%	102.1%
Count of Candidates	605	830	353 *	47 *	1687
% TMI (row)	35.9%	49.2%	20.9%	2.8%	108.8%
% candidate (column)	1.9%	17.2%	36.5%	11.2%	4.5%

Note: Some flights may be subject to more than 1 TMIs, thus Total % TMI is more than 100%

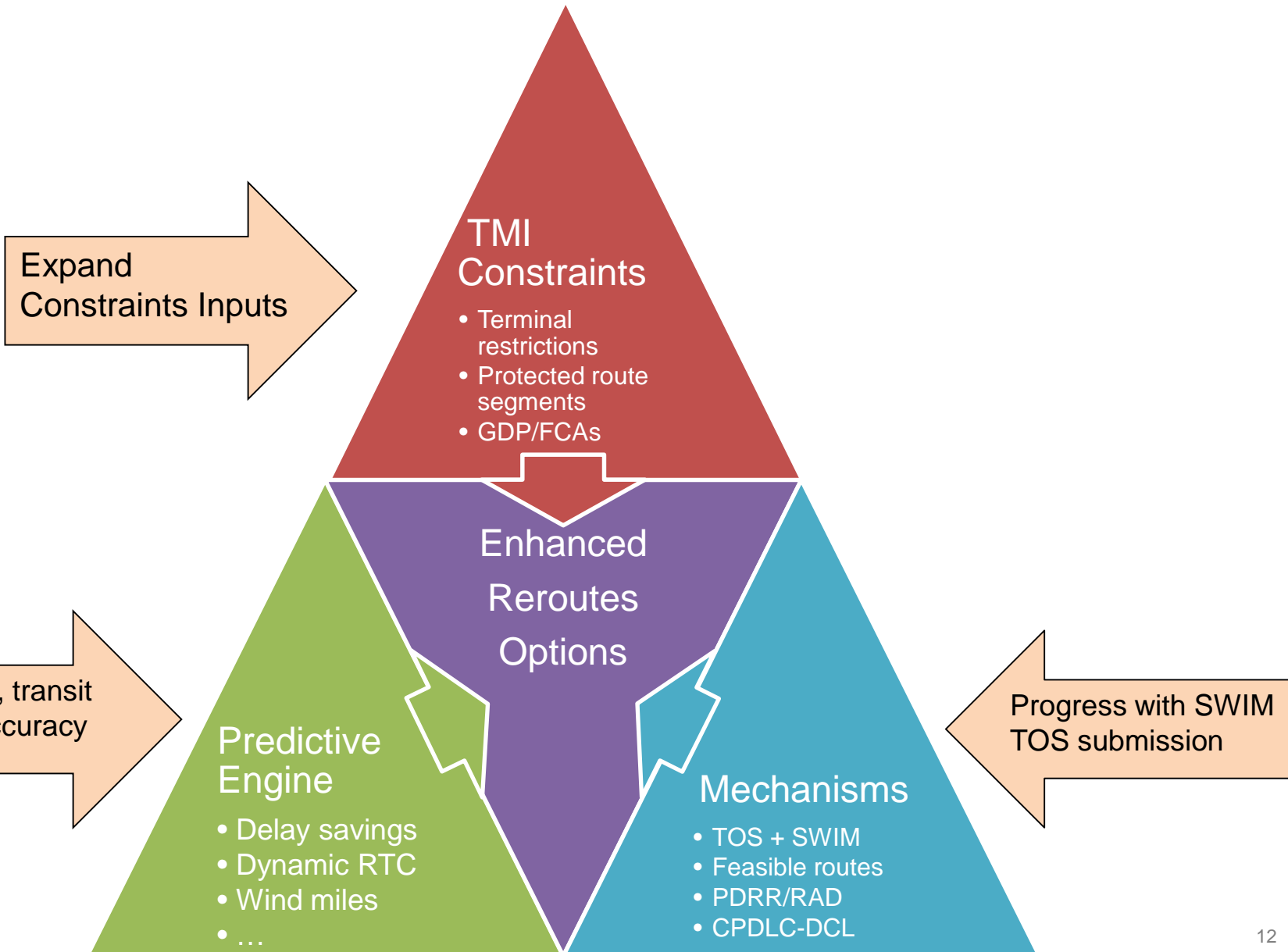
SWA & AAL flights	No Terminal Restrictions	Terminal Restriction	% of restrictions	Total
EDCT flights	780	186	19%	* 966
EDCT candidates	252	101	29%	* 353
APREQ flights	351	70	17%	* 421
APREQ candidates	29	18	38%	* 47



- 23 alternative routes for 23 flights were SUBMITTED by Flight Operators
 - 8 times when 10-15 MIT (with and without fix closed)
 - 15 times when no TMI
- 3 routes were then unsubmitted
- 16 alternative routes were APPROVED by ATC
 - 7 times when 10-15 MIT (with or without fix closed)
 - 9 times when no TMI
- 10 reroutes were filed (amended) by ATC
- 8 flights actually flew an alternative route
 - Total of **49.5min of estimated delay savings** (avg 6.1min)
 - 3 times when MITs – total of **28.5min of estimated delay savings** (avg 9.5min)
 - 5 times when no TMI – total of **21.1min of estimated delay savings** (avg 4.2min)
- 6 procedural tests were conducted without executing any reroute
- 2 flight crew rejected the reroute based on mx and wx issues


- Review of current TOS activation process
 - Maximizing benefits with current capability
- Summary of recent changes to the system
- Discuss potential future capabilities







Near-Term Fall 2019

- 
- TOS Route Availability Monitor (Oct 28th)
 - Manual entries by ZFW based on awareness of DCC's reroute restrictions
 - Updates based on terminal SWAP and fix closures
 - Single flight exclusion from TOS (by Operator or ATC)
 - Dynamic RTC menu (Nov-Dec)

Mid-Term Potentials Stormy 20

- For Consideration For Stormy 20 (pending on feasibility and your feedback)
 - Inclusion of additional FO data, i.e. winds miles, for RTC and route computations
 - Automatic update in TOS RAM when flights and CDR route are available for reroute
 - Parsing of DCC Playbook reroute advisories
 - Parsing of FCAs
 - Exemption of EDCT flights when TOS reroute flies outside of an FCA
 - DCC's modification of Playbook to maximize use of existing CDR
 - Progress towards submitting TOS to TFM SWIM (CDRs)
 - Provide deterministic benefit pool with aggregated data

Longer Term Potentials (not discussed today)

- Likely Beyond ATD-2
 - Flight plan amendments with PDRR/RAD
 - Route modifications to comply with DCC's reroute restrictions
 - Submit dynamic TOS to SWIM (could support modified routes)
 - Rescheduling GDP's EDCT when rerouted



- Current Limitations
 - Downstream restrictions, such as DCC's reroute advisories prevent certain TOS CDR routes from being viable candidates to submit
 - Downstream restrictions, such as GDPs/AFPs prevent flights from being viable candidate for reroute
- Near-Term Capability
 - Provide TOS Reroute Availability Monitoring (TOS RAM) window to ZFW STMCs to indicate when TOS CDR routes, and TMI flights, such as EDCT need to be excluded
 - Display TOS reroute availability to ATC and FO users on the interface

Metroplex Planner
TOS Reroute Availability Monitor

APREQ Schedule
MIT Restrictions
Dep Fix Closures
Ground Stops
TOS Operation

TOS Submission

Active
 Inactive

Destination (all routes) – Exclusion Filter

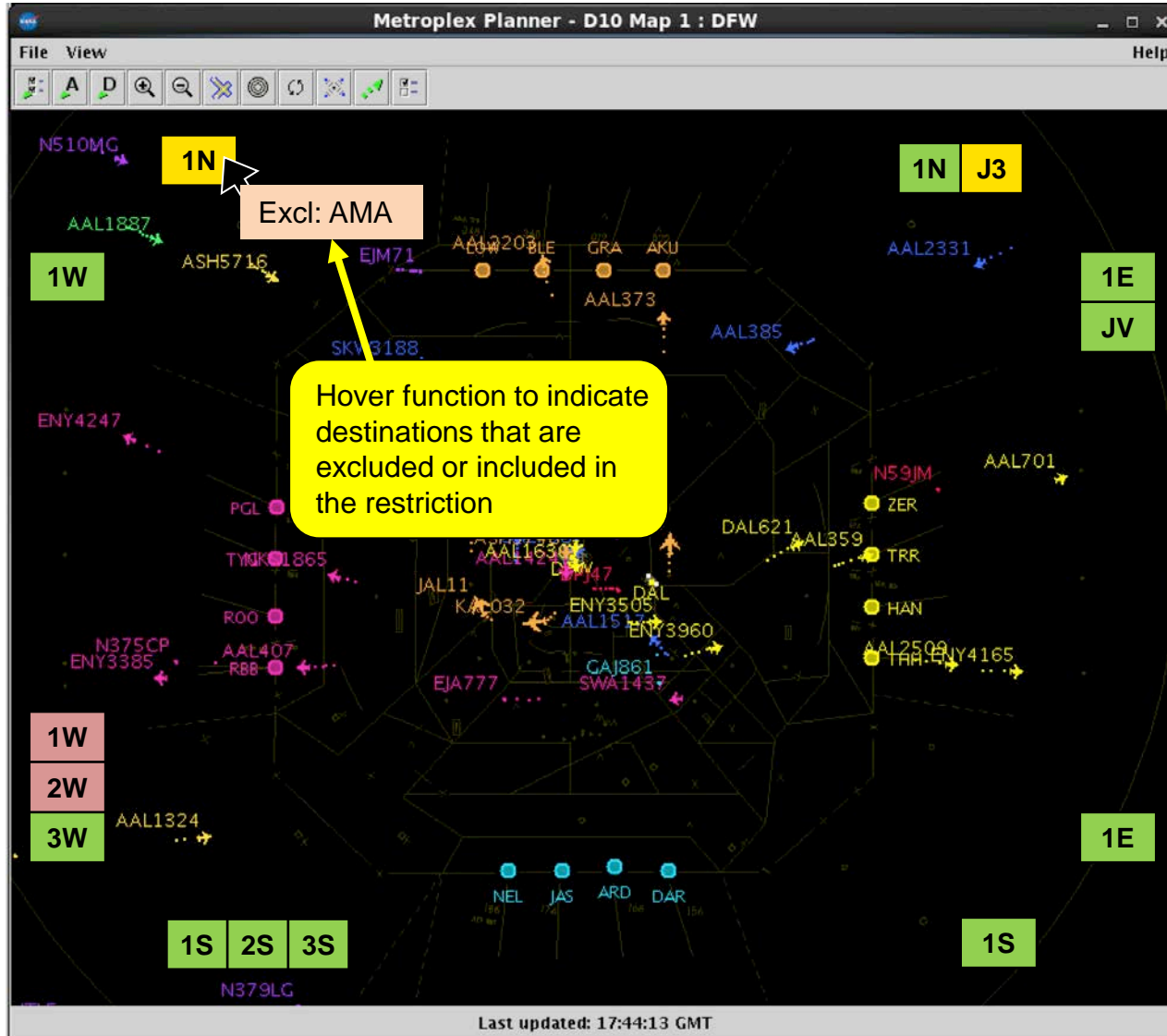
Airport:

CDR – Filter

NW	Restricted	CDR	Remark	Constraint	NE	Restricted	CDR	Remark	Constraint
Via LOWGN	<input checked="" type="checkbox"/>	1N	Excl: AMA	<input type="button" value="Set"/>	Via AKUNA	<input type="checkbox"/>	1N		<input type="button" value="Set"/>
Via HUDAD	<input type="checkbox"/>	1W		<input type="button" value="Set"/>		<input checked="" type="checkbox"/>	J3	Incl. LGA, EWR	<input type="button" value="Set"/>
					Via ZACHH	<input type="checkbox"/>	1E		<input type="button" value="Set"/>
						<input type="checkbox"/>	JV		<input type="button" value="Set"/>
SW	Restricted	CDR	Remark	Constraint	SE	Restricted	CDR	Remark	Constraint
Via WSTEX	<input checked="" type="checkbox"/>	1W		<input type="button" value="Set"/>	Via MRSSH	<input type="checkbox"/>	1E		<input type="button" value="Set"/>
	<input checked="" type="checkbox"/>	2W		<input type="button" value="Set"/>	Via DARTZ	<input type="checkbox"/>	1S		<input type="button" value="Set"/>
	<input type="checkbox"/>	3W		<input type="button" value="Set"/>					
Via NELYN	<input type="checkbox"/>	1S		<input type="button" value="Set"/>					
	<input type="checkbox"/>	2S		<input type="button" value="Set"/>					
	<input type="checkbox"/>	3S		<input type="button" value="Set"/>					

Notes:

- Checking the restriction box will turn the 2-letter code red, and assume the route will not be available for any destinations.
- Setting an exclusion or an inclusion will turn the color to orange.





- Current Limitations
 - Static RTC computation of TOS routes prevents FO from modifying the values
- Near-Term Capability
 - Provide FO with a menu to adjust RTC computation
 - Weight parameters on the Cost Factor
 - Minimum RTC value

MP User – RTC Parameters

Relative Trajectory Cost

Default Cost Factor air/surface ratio

Minimum Value minutes

Destination airports

List 1

List 2

Correction

Aircraft types

List 1

List 2

Correction

Time of the day (UTC)

Period 1 -

Period 2 -

Period 3 -

Period 4 -

Period 5 -

Correction

BOGUS Examples:

B781 to SAN at 1800 = 3.5

Default	2.0
Dest	0.5 (SAN)
AC type	0.5 (781)
Time	<u>0.5 (2)</u>
Total	3.5

DH8C to LGA at 1200 = 1.0

Default	2.0
Dest	0.0
AC type	-0.5
Time	<u>-0.5</u>
Total	1.0

Note:

- Rule-based parameters
- New FO parameters and new rules could be added as needed

TOS Flight Menu - AAL2235

Search Clear

Flight ID	Route	CDR	Dep Gate	Rwy	Dist nm	Add nm	RTC ▲	Term Delay OFF	Total Delay OFF	Total Delay Savings OFF	ETOT	Eligibility State	Coord State
			NORTH		642			+7	+22		00:38		
		DEN1W	WEST		613	-29	+5	-11	+4	+18	00:20	Candidate	Not Submitted
		DENGC	WEST		828	+187	+59	-11	+4	+18	00:20	Potential	Not Submitted
		DEN1S	SOUTH		887	+245	+78	-11	+4	+18	00:20	Potential	Not Submitted
		DEN2S	SOUTH		1018	+376	+120	-11	+4	+18	00:20	Potential	Not Submitted
		DEN3S	SOUTH		1081	+440	+140	-11	+4	+18	00:20	Potential	Not Submitted

MP User – RTC Parameters – XXX1234

Destination: DEN
Aircraft type: B738

Parameters

Cost Factor: air/surface cost ratio
Minimum Value: minutes

Route	Term Gate	RTC	Delay Savings
DEPDEN1W	North	5	18
DEPDENGC	South	59	18
DEPDEN1S	South	78	18
DEPDEN2S	South	120	18
DEPDEN3S	South	140	18



Near-Term Fall 2019

- TOS Route Availability Monitor (Oct 28th)
 - Manual entries by ZFW based on awareness of DCC's reroute restrictions
 - Updates based on terminal SWAP and fix closures
 - Single flight exclusion from TOS (by Operator or ATC)
- Dynamic RTC menu (Nov-Dec)

Mid-Term Potentials Stormy 20

- For Consideration For Stormy 20 (pending on feasibility and [your feedback](#))
 - Inclusion of additional FO data, i.e. winds miles, for RTC and route computations
 - Automatic update in TOS RAM when flights and CDR route are available for reroute
 - Parsing of DCC Playbook reroute advisories
 - Parsing of FCAs
 - Exemption of EDCT flights when TOS reroute flies outside of an FCA
 - DCC's modification of Playbook to maximize use of existing CDR
 - Progress towards submitting TOS to TFM SWIM (CDRs)
 - Provide deterministic benefit pool with aggregated data

Longer Term Potentials (not discussed today)

- Likely Beyond ATD-2
 - Flight plan amendments with PDRR/RAD
 - Route modifications to comply with DCC's reroute restrictions
 - Submit dynamic TOS to SWIM (could support modified routes)
 - Rescheduling GDP's EDCT when rerouted



- Current Limitations
 - ATD-2 system compute routes (filed and alternative) mile distances based on point-to-point 2-D trajectory
 - Airlines compute transit time that includes:
 - Direction of flow at the departure airport (done)
 - “Wind miles” correction based on direction and velocity of winds
- Potential Mid-Term Capability
 - Ingest FO’s TBD data via Java Message Service
 - Modify mileage, and/or use transit time, to account for winds in the ATD system
- Potential Mid-Term Synergies
 - Use of dynamic RTC



- Current Limitations
 - Static RTC computation of TOS routes prevents FO from modifying the values
- Potential Mid-Term Capability
 - Leverage menu to adjust RTCs
 - Add new parameters, rules, and computation to prioritize rerouting of flights, as needed
- Potential Mid-Term Synergies
 - Use of wind/transit time data for RTC and delay savings



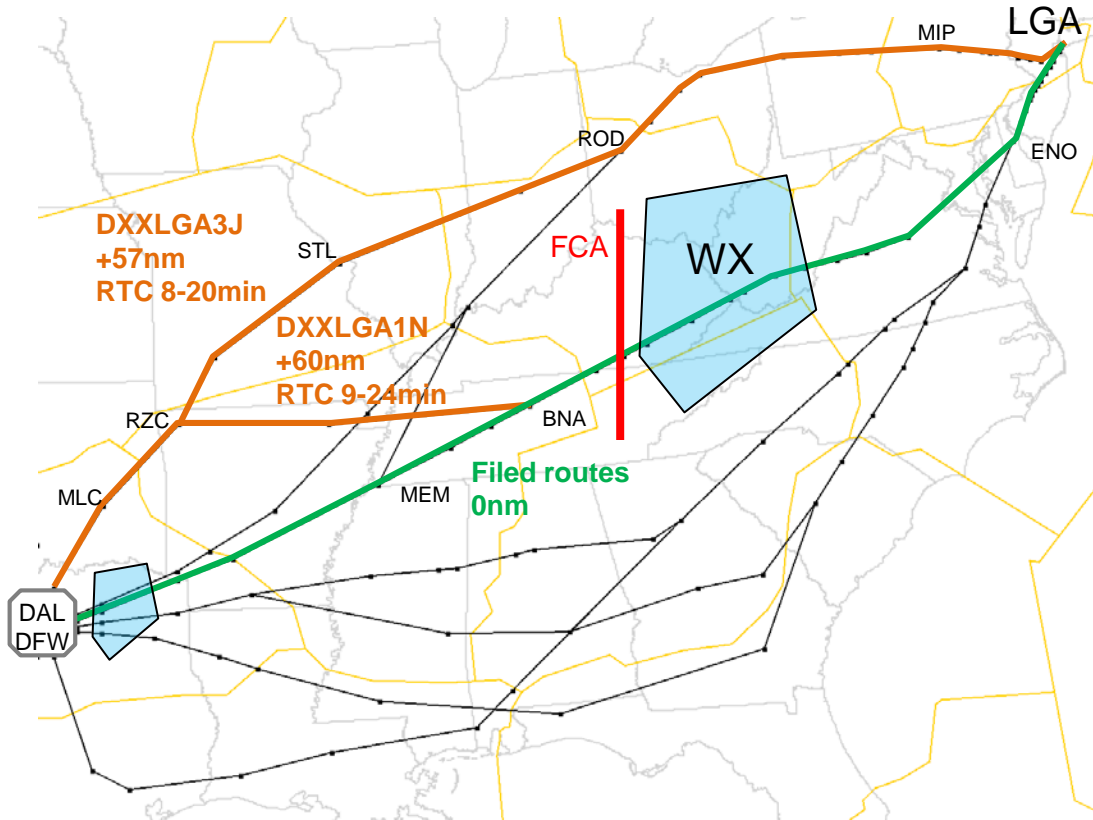
- Current Limitations
 - Downstream restrictions, such as DCC's reroute advisories prevent certain TOS CDR routes from being viable candidates to submit
 - Downstream restrictions, such as GDPs/AFPs prevent flights from being viable candidate for reroute
- Potential Mid-Term Capability
 - Leverage TOS RAM and Map displays
 - Parse DCC reroute advisories to automatically detect when TOS/CDR and flights are impacted
 - Provide ATD system to DCC to give opportunities to modify reroutes advisories
- Potential Mid-Term Synergies
 - Exemption of EDCT on routes that are outside of FCA



- Current Limitations
 - EDCT flights who are subject to AFP/FCA and GDP are excluded in the TOS reroutes to comply with the Controlled Take Off Time
 - Not accounting for EDCT flights who would be exempted if rerouted outside of AFP/FCAs
- Potential Mid-Term Capability
 - Analyze of benefit pool of flights subject to AFP/FCAs
 - 22% of EDCTs were driven by FCAs during 7/22-8/26
 - Parse AFP data to automatically detect when flights and which TOS/CDR are impacted
 - Identify TOS routes that would be exempt of AFP
 - Allow flight to be exempt when rerouted on a route outside of the FCA
- Potential Mid-Term Synergies
 - Parsing other NAS Wide TMIs from TFM Data, such as DCC's Reroute advisories

Use Cases with EDCT Flights (AFP Case)

Mid-Term Potential



FCA case

The alternative route no longer crosses the arc and therefore the flight becomes exempt

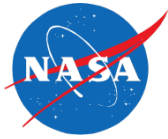
Routes	Filed route	Alt Route	Time diff
UTOT	11:45	11:45	0min
EDCT	12:30	12:00	-30min
Flight time	03:30	03:45	+15min
STA (FCA)	16:00	15:45	-15min
Overall savings		00:15	-15min

Ideal capability would:

- Detect routes outside of FCAs
- Accounts for Wind miles in flight transit time
- Reschedule EDCT when rerouted



- Current Limitations
 - ATD system relies on static CDR routes
 - Initial test indicates that current TOS messages in TFM Data may be incomplete (RTC missing in messages)
- Potential Mid-Term Capability
 - *Making progress towards* a TOS submission to SWIM via ATD system (actual data elements TBD)
 - Determine updates (event based?)
 - Develop and test SWIM messaging outside of CTOP
- Potential Mid-Term Synergies
 - Dynamic RTC



- Current Limitations
 - System identifies delay savings for one flight at the time
 - No metrics of potential aggregate delay savings
- Potential Mid-Term Capability
 - Show real-time metrics of predictable benefits
 - Identify benefit pool metrics (delay savings for multiple flights)
 - Identify deterministic mechanism to indicate real-time benefits
- Potential Synergies
 - Local and remote TMIs
 - Dynamic RTC



Near-Term Fall 2019

- TOS Route Availability Monitor (Oct 28th)
 - Manual entries by ZFW based on awareness of DCC's reroute restrictions
 - Updates based on terminal SWAP and fix closures
 - Single flight exclusion from TOS (by Operator or ATC)
- Dynamic RTC menu (Nov-Dec)

Mid-Term Potential Stormy 20

- For Consideration For Stormy 20 (pending on feasibility and [your](#) feedback)
 - Inclusion of additional FO data, i.e. winds miles, for RTC and route computations
 - Automatic update in TOS RAM when flights and CDR route are available for reroute
 - Parsing of DCC Playbook reroute advisories
 - Parsing of FCAs
 - Exemption of EDCT flights when TOS reroute flies outside of an FCA
 - DCC's modification of Playbook to maximize use of existing CDR
 - Progress towards submitting TOS to TFM SWIM (CDRs)
 - Provide deterministic benefit pool with aggregated data

Longer Term Potentials (not discussed today)

- Likely Beyond ATD-2
 - Flight plan amendments with PDRR/RAD
 - Route modifications to comply with DCC's reroute restrictions
 - Submit dynamic TOS to SWIM (could support modified routes)
 - Rescheduling GDP's EDCT when rerouted





- Current Limitations
 - ATC personnel relies on existing tool, such as the FDIO, to amend flights plans
 - ATC personnel is limited to approve static TOS routes (CDR)
 - Deployment of new version of PDRR/RAD on the Departure Viewer
 - at ZFW may be outside of ATD-2 demonstration
 - At DFW may not be feasible
 - (TOS) Routes in PDRR/RAD:
 - Are ranked order based on RTC (lowest RTC may not best route, unless only requested reroutes are listed in the TOS)
 - Do not time out (issue with updating TOS?)
 - PDRR/RAD does not alert ATC user when TOS has been submitted (requires phone call)
- Long-Term Potential
 - Use beta version of PDRR/RAD in the Departure Viewer at ZFW
 - Approval of submitted TOS via SWIM via PDRR/RAD at the Towers
- Potential Synergies
 - Submission of TOS via SWIM
 - Modification of TOS routes

Route Amendment

Retrieve Routes

Show
 Flight / Route Color
 Protected Segments

Show Merge ID
 AAL482
 AAL616
 EFG3214

Current Routes

✈	KDFW.NOBLY3.LIT.J131.PXV.RACYR1.KIND	RRDCC015	---	Rte Opts...
✈	KDFW.NOBLY3.LIT.J131.PXV...VHP..FWA.LOREM.DUIS.AUTE.IRURE.MIZAR3.KDTW	(MULTIPLE)	---	Rte Opts...
✈	KDFW.TRISS3.TXK.J42.MEM.BWG.UNCKL..KLEX		---	Rte Opts...

Retrieved Routes
 MANUAL

Assigned Routes
 MIDWEST_WX KDFW.LOREM.IPSUM.DOLOR.SIT.AMET.KATL RRDCC015

Create Route Amendment:

	P-Time	Sector	TMI ID	RRSTAT
✈	<input type="checkbox"/> ALL			
✈	<input type="checkbox"/> AAL482			
✈	<input type="checkbox"/> AAL616			
✈	<input type="checkbox"/> EFG3214 2358			

Amendment will be sent for 0 flights

Select the flights to be rerouted

Construct the New Route

Merge the Current and New Route

Send to ERAM

Note: the RAD would be available from the Departure Viewer

Route Amendment

Retrieve Routes: Recently Sent... Search DB... Route Code: [] Get CDR Add Route Remove Flights... Flight [] Protected [x]

Show Merge ID: [x] AAL482 [x] AAL616 [x] EFG321 [] MANUAL [] MIDWES

AAL482 Route Options

TMI Route Options

- KDFW.LOREM.IPSUM.DOLOR.KEWR MIDWEST_WX
- KDFW.DUIS.AUTE.IRUREKEWR MIDWEST_WX
- KDFW.VELIT.SED.QUIA.NON.KEWR MIDWEST_WX

TOS Options

- KDFW.SED.NO.DELENIT.LEGENDOS.VIM.NO.SOLUM.KEWR
- KDFW.AD.LAUDEM.FACETE.QUALIS.QUE.PER.KEWR
- KDFW.SED.NO.APERIRI.ACCUM.SAN.FOREN.SIBUS.KEWR

Add to Retrieved Routes Add to Amendment Cancel Help

RRDCC015 (MULTIPLE) Rte Opts... Rte Opts... Rte Opts...

RRDCC015

Create Route Amendment: Merge Use Last Sent Optimize Route(s)

ALL P-Time Sector TMI ID RRSTAT

Amendment will be sent for 0 flights

Send Cancel Help

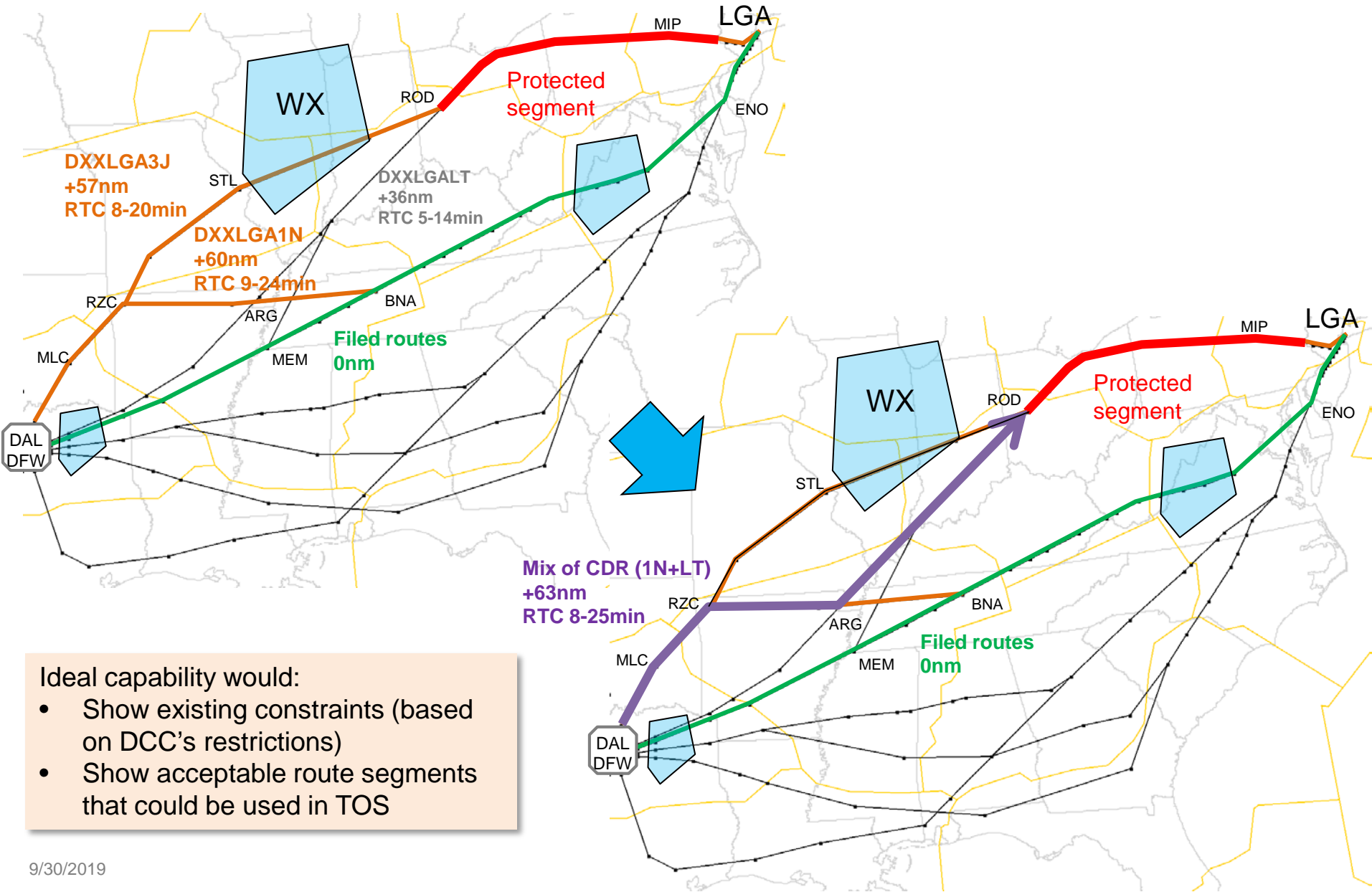
Rte Opts: Displays all of the options in the current TOS if one exists.

Will display up to 3 Assigned Route options before needing a scroll bar. The TOS Options area can display up to 5 and will not need a scroll bar.

- Current Limitations
 - CDR in the TOS may conflict with NAS wide reroute restrictions
- Potential Long-Term Capability
 - Leverage existing parsing of NAS wide TMIs, such as Playbook advisories
 - Provide route modification options based on TBD criteria, such as partial CDR route segments, to comply with reroute restrictions, as needed
- Potential Long-Term Synergies
 - Wind data
 - Dynamic RTC
 - Parsing of NAS wide restrictions
 - Submission of TOS via SWIM
 - Use of PDRR/RAD and CPDLC-DCL

Use Cases with Route Modification

Long-Term Potential

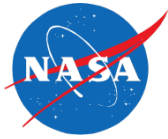


Ideal capability would:

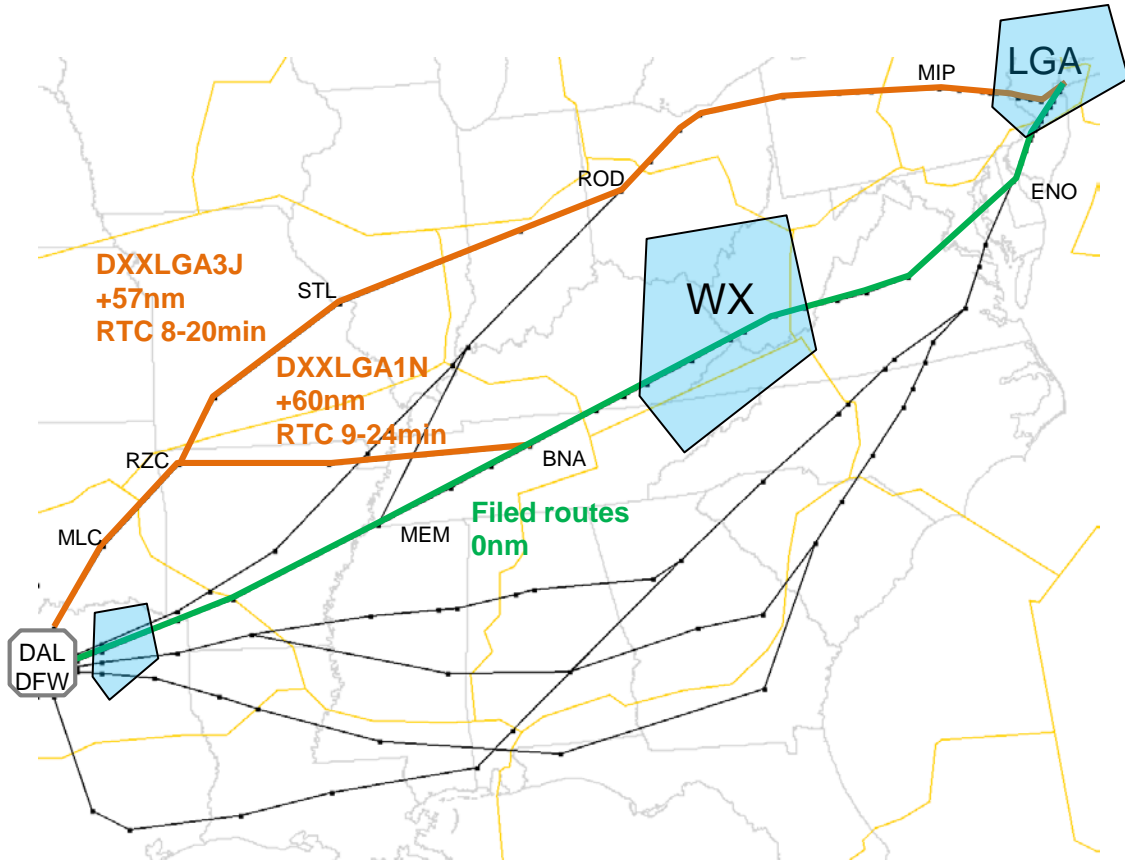
- Show existing constraints (based on DCC's restrictions)
- Show acceptable route segments that could be used in TOS



- Current Limitations
 - ATD system relies on static CDR routes
 - Initial test indicates that current TOS messages in TFM Data may be incomplete (RTC missing in messages)
- Potential Long-Term Capability
 - Leverage ATD-2 submission of TOS to SWIM
 - Data exchange to support TOS submission to SWIM?
 - Submission of dynamic ad-hoc TOS routes (beyond CDR)
- Potential Long-Term Synergies
 - Dynamic RTC
 - Approve TOS reroute with PDRR/RAD
 - Modification of TOS routes based on TMIs



- Current Limitations
 - EDCT flights who are subject to AFPs and GDPs are excluded in the TOS reroutes to comply with the Controlled Take Off Time
 - Unclear if EDCT flights are getting rescheduled in TFMS when ETD or its route change by the FO or ATC (to be verified)
- Potential Long-Term Capability
 - Reschedules EDCT *within* the ATD-system based on longer alternative route to comply to arrival time
 - Flight plan amendment for a reroute would update EDCT in the TFMS system
- Potential Synergies
 - Parsing other NAS Wide TMIs from TFM Data, such as DCC's Reroute advisories
 - Submit TOS to SWIM
 - Approve TOS reroute with PDRR-RAD



GDP case

Any alternative route remains subject to EDCT compliance (non-exempt)

Routes	Filed route	Alt route	Time diff
UTOT	11:45	11:45	0min
EDCT	12:30	12:15	-15min
Flight time	03:30	03:45	+15min
STA (dest)	16:00	16:00	0min
Overall savings		00:00	0min

Ideal capability would:

- Accounts for Wind miles in flight transit time
- Reschedule EDCT when rerouted
- Accounts for DCC advisories



Near-Term Fall 2019

- TOS Route Availability Monitor (Oct 28th)
 - Manual entries by ZFW based on awareness of DCC's reroute restrictions
 - Updates based on terminal SWAP and fix closures
 - Single flight exclusion from TOS (by Operator or ATC)
- Dynamic RTC menu (Nov-Dec)

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- For Consideration For Stormy 20 (pending on feasibility and [your feedback](#))
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- Likely Beyond ATD-2
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 - Route modifications to comply with DCC's reroute restrictions
 - Submit dynamic TOS to SWIM (could support modified routes)
 - Rescheduling GDP's EDCT when rerouted

Backup



- Implement Lessons Learned from Stormy 19
- Develop Enhanced Capabilities
 - Demonstrate and evaluate benefits
 - Document Technology Transfer and Lessons Learned
 - Analyze potential benefits for future capability, as needed
- Collect Data
 - During operational use
 - At targeted dates
- Measure Benefits
 - Developing reports
 - Refinement of accuracy
 - Analyses of delay savings and other metrics of interests