



Dynamic Routes for Arrivals in Weather

Concept Overview and Status

NASA/FAA/MITRE TBO Technical Exchange Meeting
3 April 2019



Today's Arrival Operations

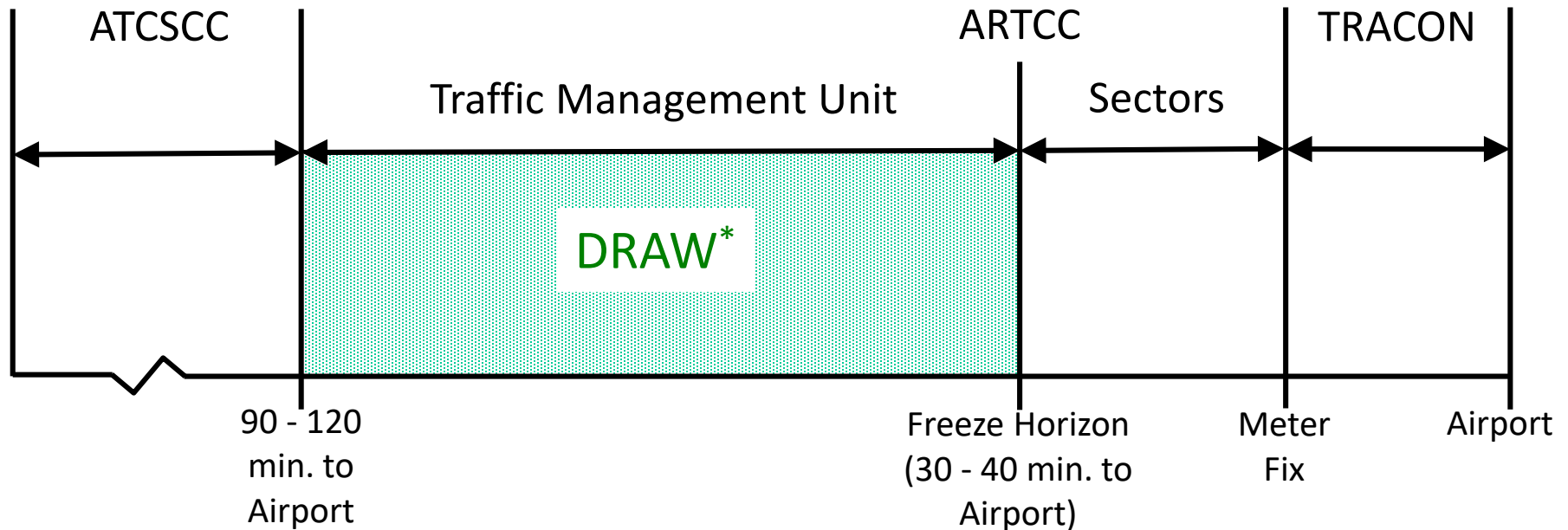
- Weather is a primary reason for discontinuance of time-based metering
- Current operational system cannot adjust its scheduled times of arrival (STAs) for aircraft that need to deviate around weather
- Traffic Managers and Controllers revert to less efficient methods of managing arrival traffic flow in weather
 - Implement conservative alternate routes hours in advance
 - Miles-in-trail (MIT)
 - Tactical deviations by controllers



What is DRAW?

Traffic management decision support tool that proposes reroutes to improve arrival traffic flow

- Sustain metering operations in the presence of weather
- Find efficient arrival routes
- Offload meter fix demand (future capability)





DRAW System

Planview GUI

DRAW
Advisory List

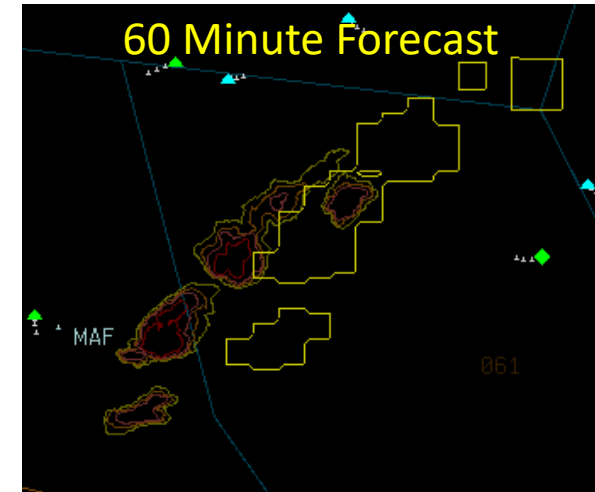
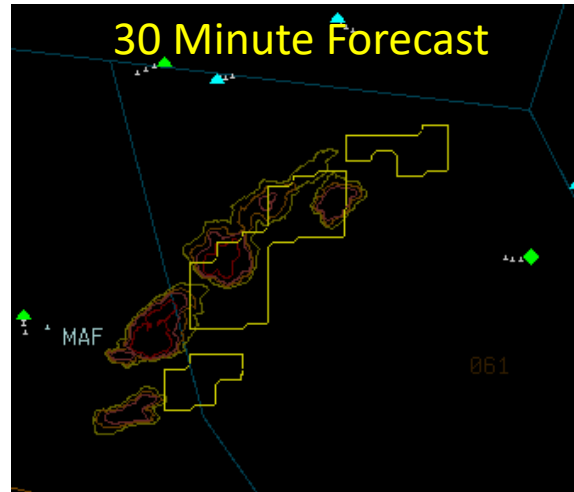
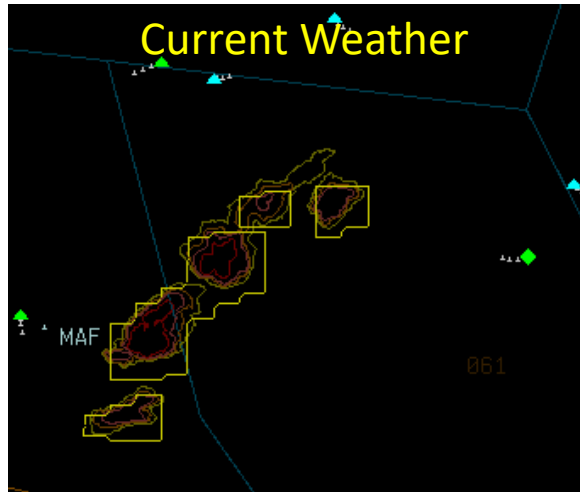
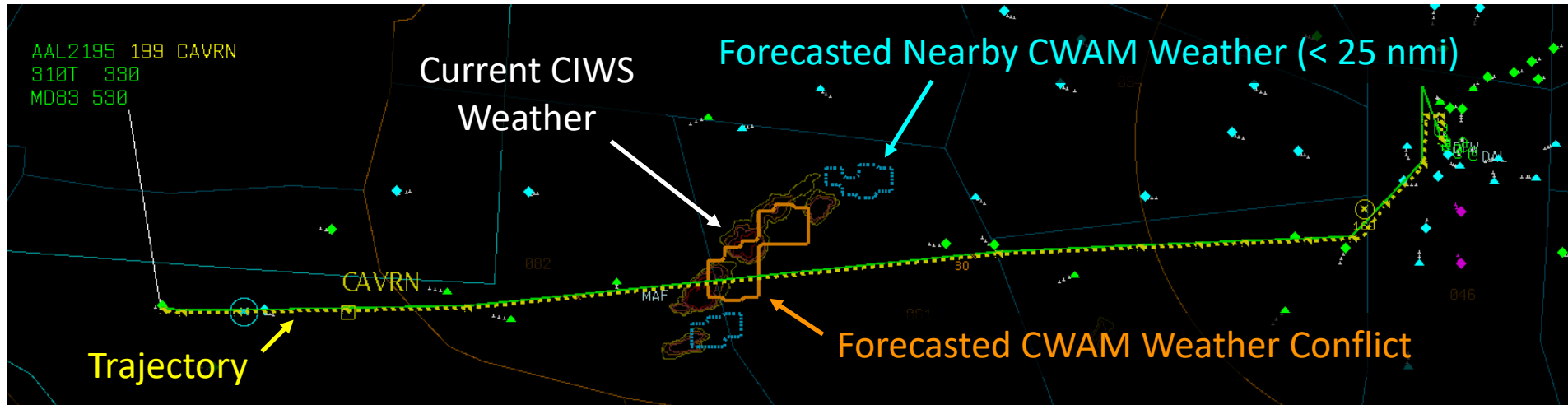
Timeline GUI

Trial Planner

- Initially developed in CTAS, currently being integrated into **TBFM**
- Reroute candidates automatically identified and posted on DRAW Advisory List
 - Hourly atmospheric updates (**NOAA RR**)
 - **ERAM** traffic feed from home and adjacent Centers
 - Two-hour convective weather forecast (**CIWS, CWAM**)
- Integrated Route and Schedule Trial Planner



Trajectory Based Weather Modeling

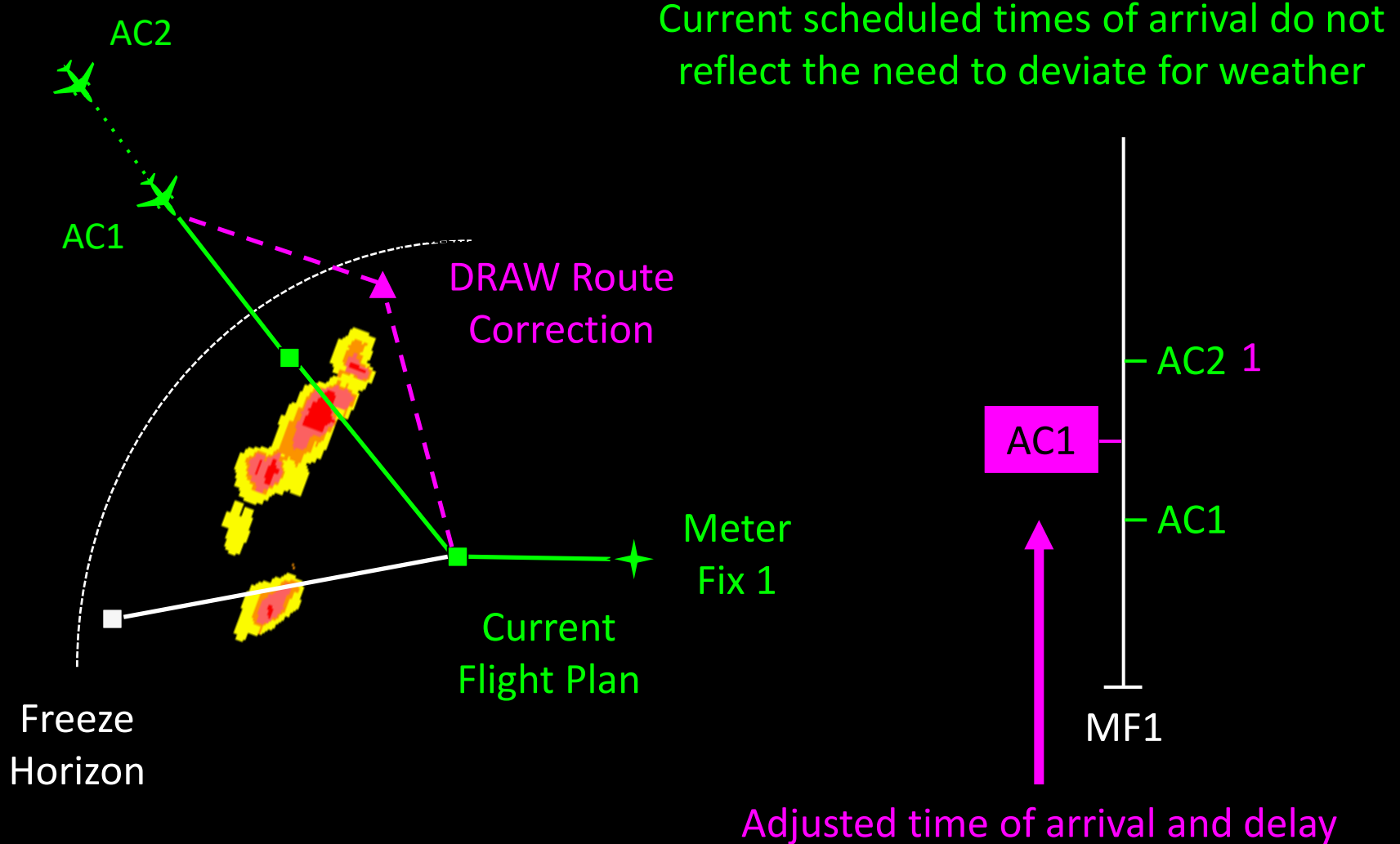


CIWS*: Corridor Integrated Weather System (precipitation, echo tops)
CWAM*: Convective Weather Avoidance Model (pilot deviation model)

*- Products of MIT Lincoln Laboratory

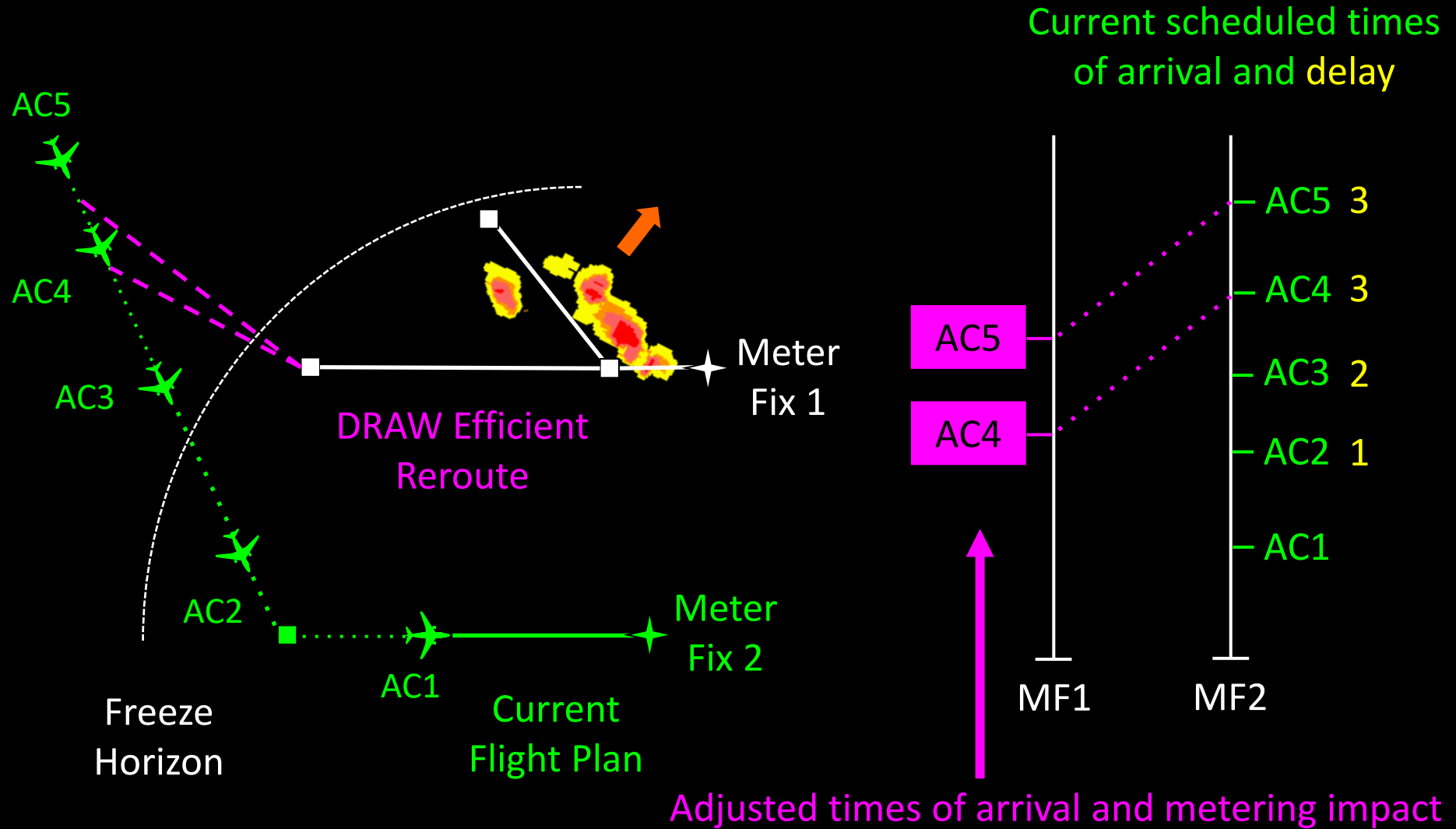


Route Correction to Avoid Weather and Maintain Accurate Schedule Time of Arrival





Time Saving Reroutes to Alternate Meter Fix





DRAW Advisory List

Individual Advisory

Group Advisory

Time Savings

Proposed Arrival Route

TL	TP	GP	ACID/DEP/ARR	SAV	TRANS.STAR/AUX	STATUS
<input checked="" type="checkbox"/>		DEBBB	GREGS			
	<input type="checkbox"/>		EJA763/KAPA/KDAL	0.0	GREGS.JFRYE3	OK
	<input type="checkbox"/>	<input type="checkbox"/>	JTL25/KBJC/KDAL	-0.0	GREGS.NANDR3/1	OK
	<input type="checkbox"/>	<input type="checkbox"/>	SWA1131/KSEA/KDAL	0.1	GREGS.NANDR3/1	OK
	<input type="checkbox"/>	<input type="checkbox"/>	N224KL/KMEV/KDAL	-0.2	GREGS.NANDR3/1	OK
	<input type="checkbox"/>		AAL128/ZSPD/KDFW	-3.5	ZUBOV.JOVEM3/1	OK
	<input type="checkbox"/>		AAL2423/KMSP/KDFW	9.0	JONEZ.CAINE2	ALT
	<input type="checkbox"/>		AAL9655/KABQ/KDFW	-10.7	LAYMN.JOVEM3/1	OK
	<input type="checkbox"/>		AAL1402/KSEA/KDFW	-0.5	DEBBB.JOVEM3/1	OK
	<input type="checkbox"/>		ENY3246/KRAP/KDFW	3.7	DEBBB.VKTRY1	OK
<input checked="" type="checkbox"/>		FEVER	BOOVE KNEAD			
	<input type="checkbox"/>		VRD878/KLAX/KDAL	0.5	GREGS.NANDR3	OK
	<input type="checkbox"/>		CPZ5731/KLAX/KDFW	9.7	POTTY.VKTRY1	ALT
	<input type="checkbox"/>		AAL1547/KLAS/KDFW	-0.1	DEBBB.JOVEM3/1	OK
	<input type="checkbox"/>		SKW4525/KSLC/KDFW	6.4	HOFFF.VKTRY1	ALT
	<input type="checkbox"/>		ASA662/KSEA/KDFW	21.6	BOOVE.SOCKK2/1	OK
<input checked="" type="checkbox"/>		KARLA	BRDJE SASIE	FINGR		
<input type="checkbox"/>		HOWDY	DODJE ORVLL	YEAGR		

Grouped By Meter Fix

DRAW Status

OK: Weather Deviation Route

ALT: Alternate STAR



Notional DRAW Reroute Process

Traffic Management Coordinator

TBFM

DRAW System

DRAW Advisory List

Select single or multiple flights

Trial Plan Route and Schedule

Evaluate Reroute

Coordinate/Implement Reroute(s)

Voice

Area Supervisor

Voice

ABRR

Sector Controller(s)

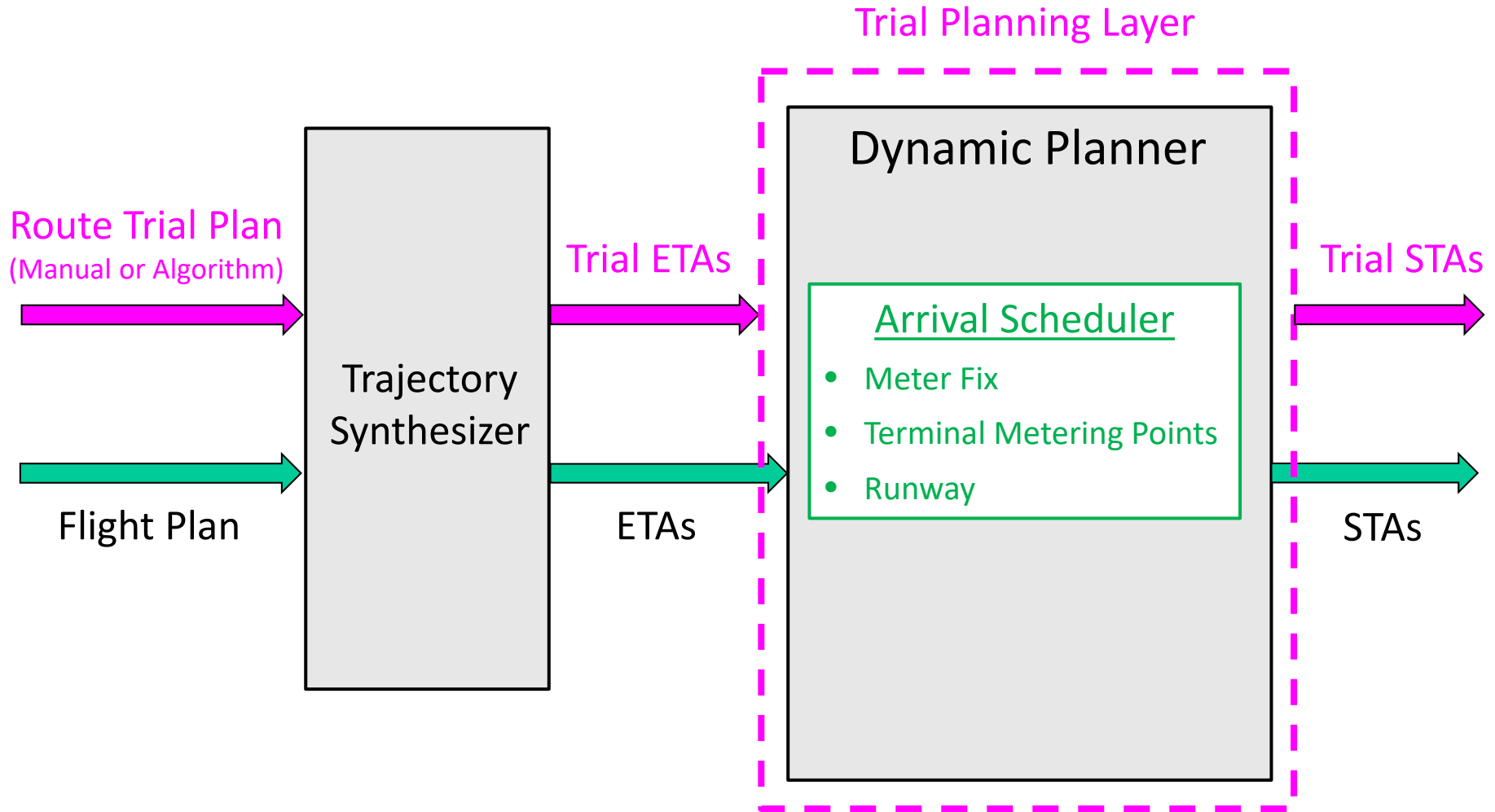
Data Comm

Voice

Flight(s)



Integrated Route-Schedule Trial Planner Concept





DRAW

Integrated Route and Schedule Trial Planner Example



DRAW Trial Planning: Trial Plan Activation

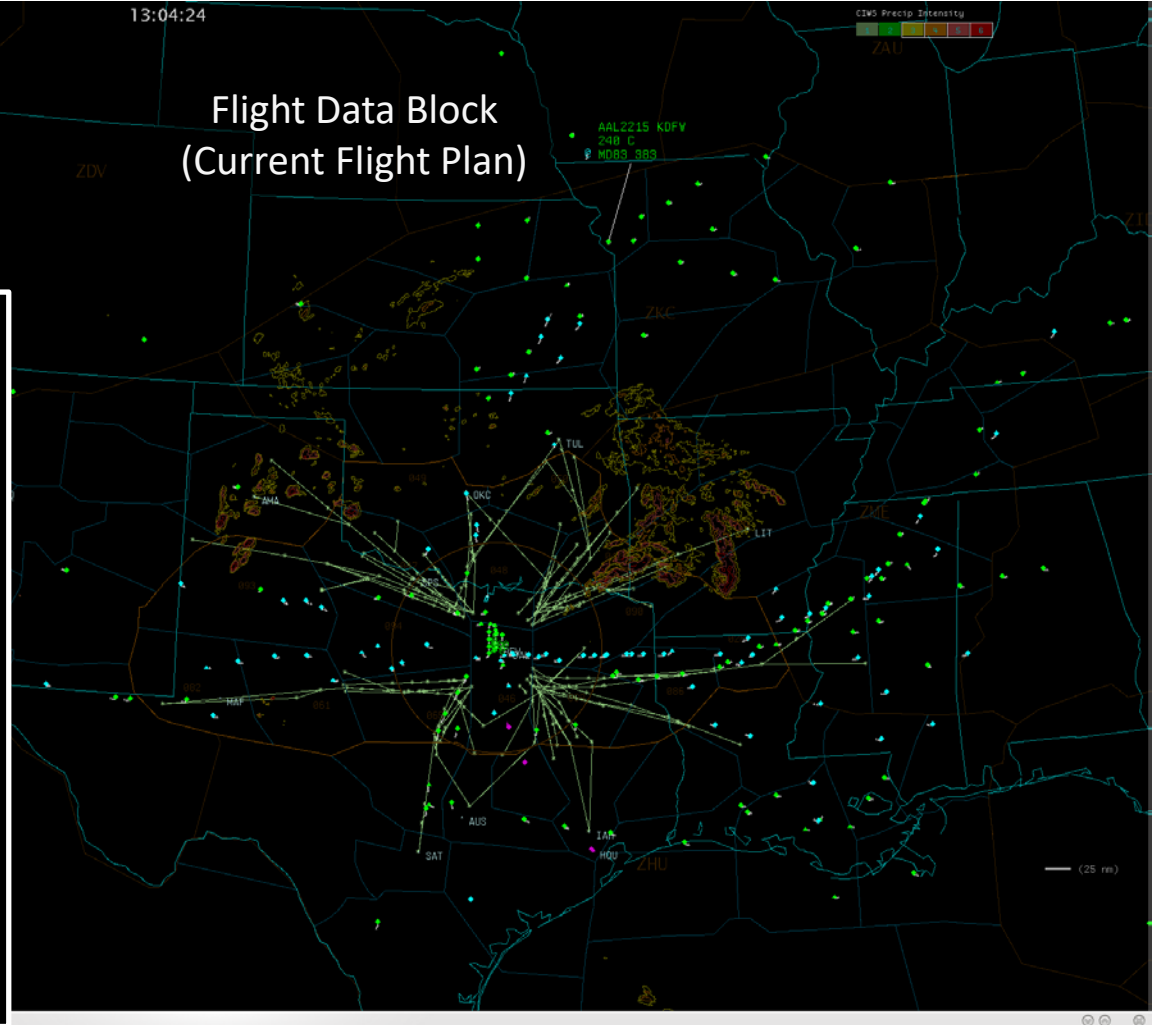
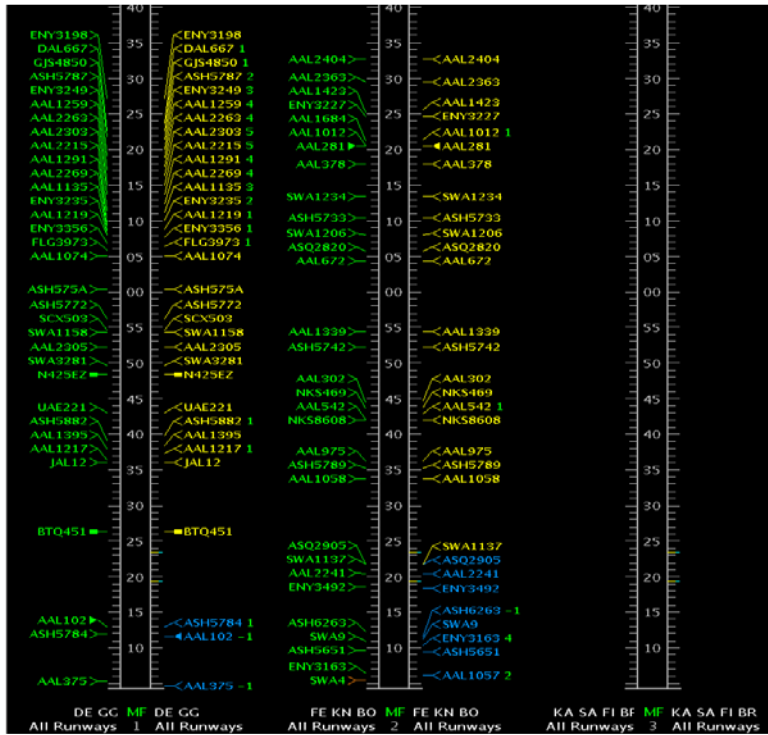
File Edit F-keys Panels Options Help Draw Alert Criteria: 5 min 13:04:24

DRAW Advisories

TL	TP	GP	ACID/TYPE	DEP/TRAN.STAR.DEST	SAV	TRANS.STAR/AUR	STATUS
<input checked="" type="checkbox"/>	DEBB	1	GRECS 1				
<input type="checkbox"/>			SWA3281/6738	KMDH/HYDTS, JFRYES, KDAL	7.5	AIRRF, CRIT1	ALT
<input type="checkbox"/>			JAL12/6788	RJAA/MDANO, JOVEM, KDFW	-9	DEBB, DGB67	ALT
<input type="checkbox"/>			DAL667/A320	KMSP/HOFFF, VKTRY, KDFW	6	DEBB, DGB67	ALT
<input type="checkbox"/>			AAL1135/M083	KDMS/HOFFF, VKTRY, KDFW	6	DEBB, DGB67	ALT
<input type="checkbox"/>			ENY3407/E145	KCMH/IBAKE, VKTRY, KDFW	28.4	ASSEL, BRJ23	ALT
<input type="checkbox"/>			GJ4850/CR37	KORD/IBAKE, VKTRY, KDFW	4	JONEZ, CAINE2	ALT
<input type="checkbox"/>			ASH5787/CR39	KSDF/IBAKE, VKTRY, KDFW	8	JONEZ, CAINE2	ALT
<input type="checkbox"/>			AAL1259/M082	CVYZ/IBAKE, VKTRY, KDFW	8	JONEZ, CAINE2	ALT
<input type="checkbox"/>			AAL2263/M083	KCMH/IBAKE, VKTRY, KDFW	13.1	JONEZ, CAINE2	ALT
<input type="checkbox"/>			AAL2303/M082	KORD/IBAKE, VKTRY, KDFW	5.9	JONEZ, CAINE2	ALT
<input type="checkbox"/>			AAL2215/M083	KORD/IBAKE, VKTRY, KDFW	8.5	JONEZ, CAINE2	ALT
<input type="checkbox"/>			ENY2257/E145	KRMH/IBAKE, VKTRY, KDFW	8.7	JONEZ, CAINE2	ALT
<input type="checkbox"/>			AAL1074/M083	KIND/IBAKE, VKTRY, KDFW	11.9	JONEZ, CAINE2	ALT
<input type="checkbox"/>			AAL1219/M083	KSLC/MDANO, VKTRY, KDFW	-1.3	DEBB, VKTRY/1	OK
<input type="checkbox"/>			ENY3677/E145	KPIA/POTTY, VKTRY, KDFW	27.7	JONEZ, CAINE2	ALT
<input type="checkbox"/>			ENY3219/E145	KATY/QUIST, VKTRY, KDFW	0.5	DEBB, VKTRY/1	OK

DRAW Advisory List

Flight Data Block (Current Flight Plan)

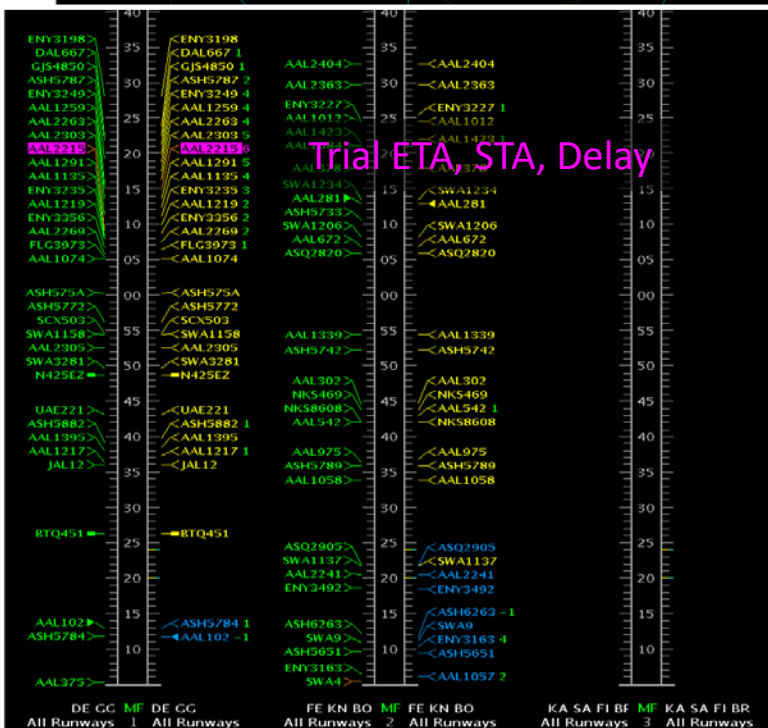
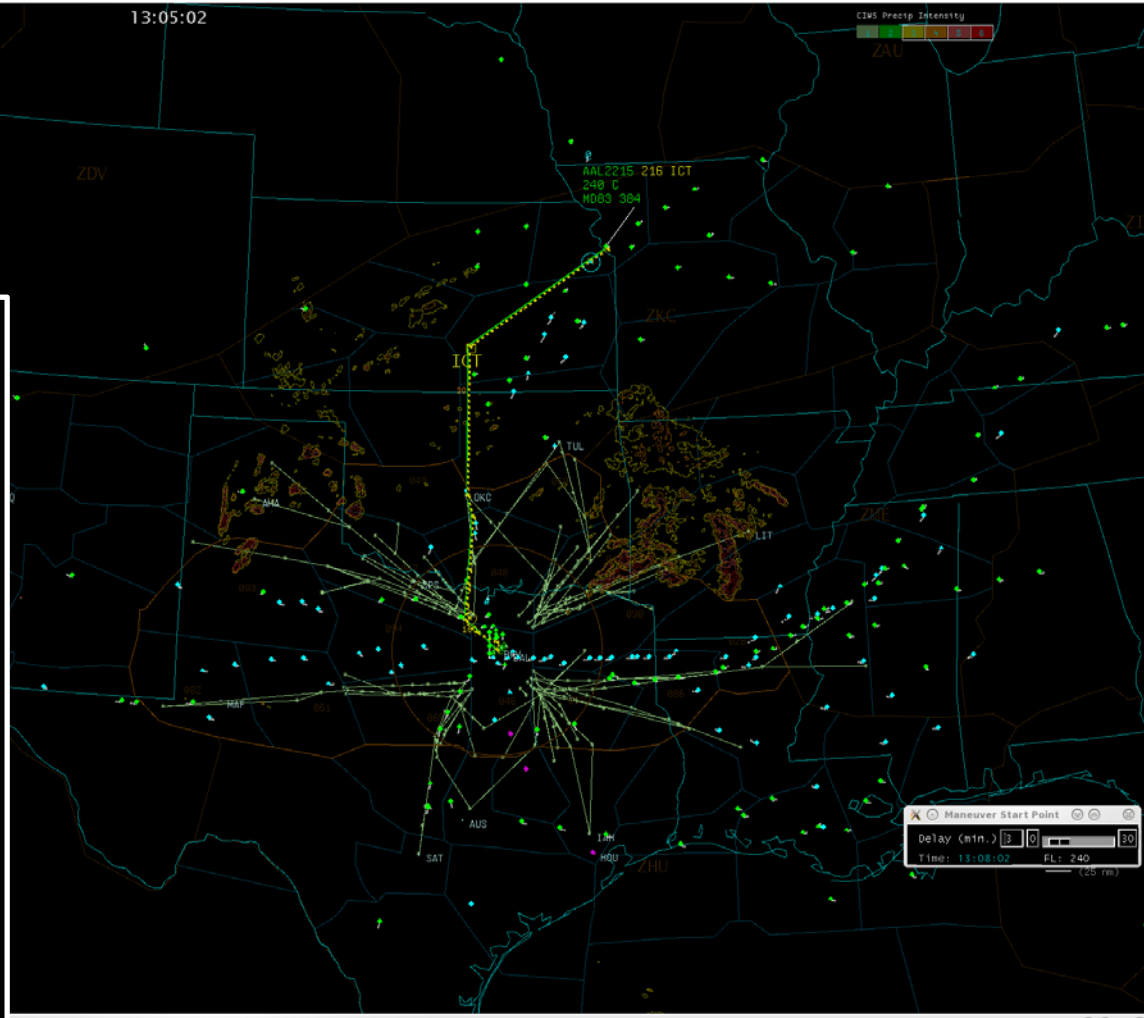


Trial Planner Window



DRAW Trial Planning: Current Flight Plan

TL	TP	GP	ACID/TYPE	DEP/TRAN.STAR	DEST	SAV	TRANS.STAR/AUX	STATUS		
DRAW Advisories										
DEBBB	I	ORGS								
			SWA3281/8738	KMDW/HYDES	JTRVE3..KDAL	7.0	AIRRE..CRIKT1	ALT		
			JAL12/8788	RJAA/MDANO	J0VEM3..KDFW	0.0	ZUBOV..J0VEM3	OK		
			DAL667/A320	KMSP/HOFFF	VKTRY1..KDFW	6.5	JONEZ..CAINE2	ALT		
			ENY3407/E145	KCMH/IBAKE	VKTRY1..KDFW	28.3	AOXFE..BRDJE3	ALT		
			GJS4850/CRJ7	KORD/IBAKE	VKTRY1..KDFW	6.7	JONEZ..CAINE2	ALT		
			AAL2263/M83	KORD/IBAKE	VKTRY1..KDFW	12.9	JONEZ..CAINE2	ALT		
			AAL2303/M83	KORD/IBAKE	VKTRY1..KDFW	5.7	JONEZ..CAINE2	ALT		
			AAL2215/M83	KDTH/IBAKE	VKTRY1..KDFW	8.1	JONEZ..CAINE2	ALT		
			ENY3235/E145	KBML/IBAKE	VKTRY1..KDFW	8.6	JONEZ..CAINE2	ALT		
			ENY3677/E145	KPIA/POTTY	VKTRY1..KDFW	27.5	JONEZ..CAINE2	ALT		
			ENY3249/E145	KGJT/TURKI	VKTRY1..KDFW	-1.9	TURKI..VKTRY1/1	OK		
			AAL2269/M83	KCOS/TURKI	VKTRY1..KDFW	7.4	LAYMV..VKTRY1	OK		
			FEVER	I	BRDJE	I	SASIE	I	FINGR	I
			KARLA	I	BRDJE	I	SASIE	I	FINGR	I
			HOWDY	I	DOOJE	I	ORVLL	I	VEAGR	I



ICR	SAV	Altitude	STATUS	Flight Plan	Current Flight Plan Route	Trial Plan Route
ICT -0.0	0.0	240	STATUS: Trial Planning	AAL2215	M83/Z	240
IRW 4.6	4.6					
IBAKE 5.3	5.3					
FAMNT 5.8	5.8					
INSTR 6.0	6.0					
RNUKI 6.0	6.0					

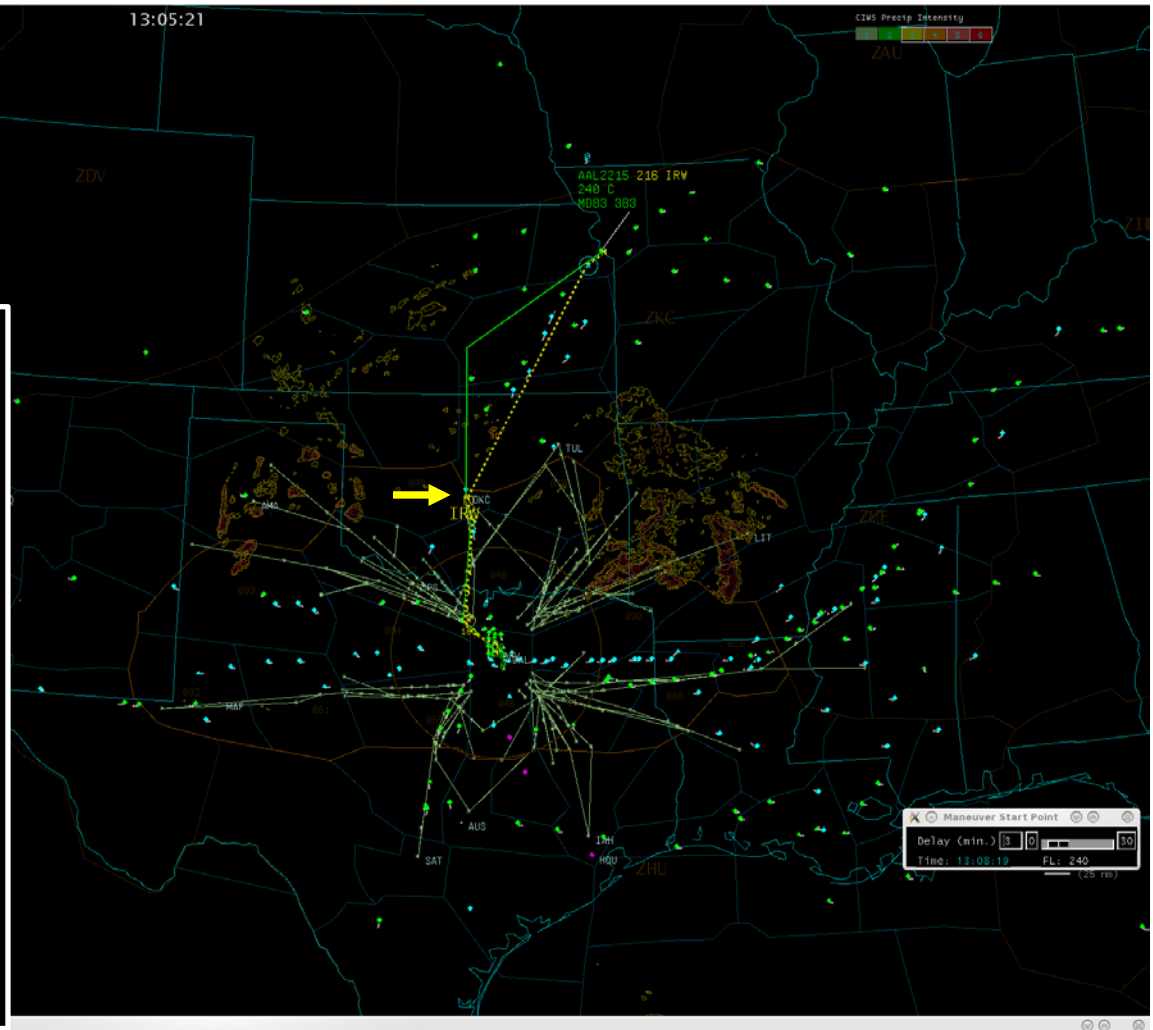
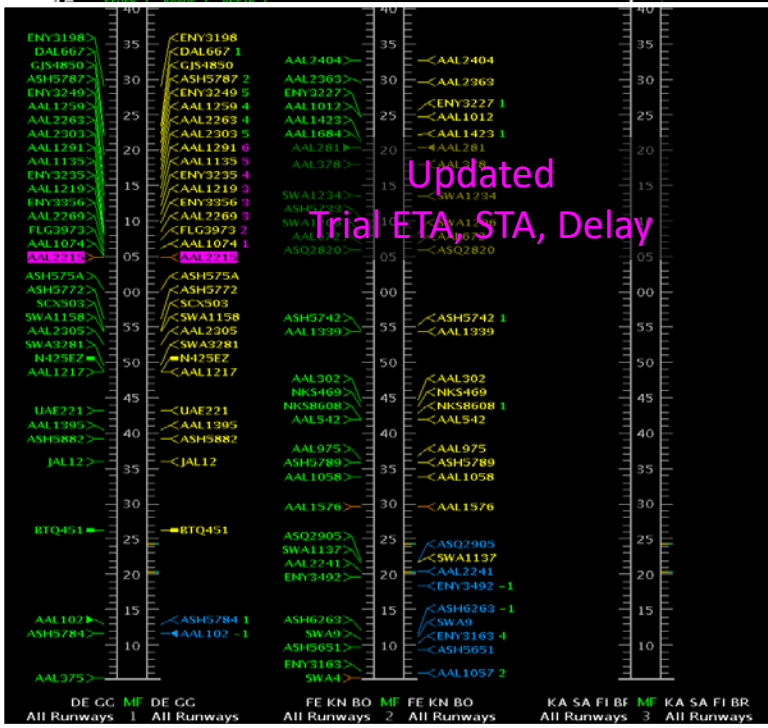
Send TRJ Approve Unable Cancel Request Accept Reject



DRAW Trial Planning: Capture Waypoint

TL	TP	GP	ACID/TYPE	DTP/TRAN.	STAR.	DEST	SAV	TRANS.	STAR/AUX	STATUS
DEBBE GREGS										
<input type="checkbox"/>			SMA3281/6738	KMDW/HYDES.	JIRVE3	KDAL	6.9	AIRRE	CR1K1	ALT
<input type="checkbox"/>			DAL667/4320	KMSP/HOFFF.	VKTRY1	KDFW	6.5	JONEZ	CAINE2	ALT
<input type="checkbox"/>			AAL1135/M083	KDMS/HOFFF.	VKTRY1	KDFW	5.9	JONEZ	CAINE2	ALT
<input type="checkbox"/>			ENY3407/1145	KCM1/IBAKE.	VKTRY1	KDFW	29.0	RRNT1	BRD313	ALT
<input type="checkbox"/>			GJS4850/CR37	KORD/IBAKE.	VKTRY1	KDFW	6.6	JONEZ	CAINE2	ALT
<input type="checkbox"/>			ASH5787/CR39	KSDF/IBAKE.	VKTRY1	KDFW	14.7	JONEZ	CAINE2	ALT
<input type="checkbox"/>			AAL1259/M082	CVYZ/IBAKE.	VKTRY1	KDFW	9.0	JONEZ	CAINE2	ALT
<input type="checkbox"/>			AAL2263/M083	KOMB/IBAKE.	VKTRY1	KDFW	12.8	JONEZ	CAINE2	ALT
<input type="checkbox"/>			AAL2303/M082	KORD/IBAKE.	VKTRY1	KDFW	5.6	JONEZ	CAINE2	ALT
<input type="checkbox"/>			AAL2215/M083	KDTW/IBAKE.	VKTRY1	KDFW	7.9	JONEZ	CAINE2	ALT
<input type="checkbox"/>			ENY3235/E145	KEMI/IBAKE.	VKTRY1	KDFW	8.5	JONEZ	CAINE2	ALT
<input type="checkbox"/>			AAL1074/M083	KIND/IBAKE.	VKTRY1	KDFW	11.4	JONEZ	CAINE2	ALT
<input type="checkbox"/>			AAL1219/M083	KSLL/MDAND.	VKTRY1	KDFW	-0.4	DEBBE	VKTRY1/1	OK
<input type="checkbox"/>			ENY3677/1145	KPIA/POTTY.	VKTRY1	KDFW	27.3	JONEZ	CAINE2	ALT
<input type="checkbox"/>			ENY3240/1145	KGJT/TURRK1	VKTRY1	KDFW	-0.5	DEBBE	VKTRY1/1	OK
<input type="checkbox"/>			AAL2269/M083	KCOS/TURRK1	VKTRY1	KDFW	7.5	DEBBE	VKTRY1	OK

13:05:21



ICL 0.0	PARLZ3	STATUS: Trial Planning	AAL2215	M083/Z	240	KDTM./MC1051010..MCI..ICT..IRW..IBAKE.VKTRY1.KDFW
IRW 4.5	SEEVN3					
IBAKE 5.3	SHAWM2					
FARMY 5.8	SOGRK2					
HNSTR 5.0	T1LLA3					
BRUKI 5.0	UKM4					
	*VKTRY1					

Altitude:

Capture Waypoints



DRAW Trial Planning: Alternate STAR

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TL	TP	GP	ACID/TYPE	DEP/TRAN.	STAR	DEST	SAV	TRANS.	STAR/AUX	STATUS	
DEBBE	I	GREGS	1								
SWA3281/8738				KMDW/HYDES	J	IRVE3	KDAL	6.6	AIRRE	CRK1	ALT
DAL667/8320				KMSF/HOFF	V	KTRY1	KDFW	6.4	JONEZ	CAINE2	ALT
AAL1135/M083				RDSH/HOFF	V	KTRY1	KDFW	5.8	JONEZ	CAINE2	ALT
ENY3407/E145				KCMH/IBAKE	V	KTRY1	KDFW	28.9	RRNET	BRDJE3	ALT
GJ54850/CR37				KORD/IBAKE	V	KTRY1	KDFW	6.5	JONEZ	CAINE2	ALT
ASH5787/CR39				KSDF/IBAKE	V	KTRY1	KDFW	14.6	JONEZ	CAINE2	ALT
AAL1259/M082				CVYZ/IBAKE	V	KTRY1	KDFW	8.9	JONEZ	CAINE2	ALT
AAL2263/M083				KCMH/IBAKE	V	KTRY1	KDFW	12.7	JONEZ	CAINE2	ALT
AAL2303/M082				KORD/IBAKE	V	KTRY1	KDFW	5.5	JONEZ	CAINE2	ALT
AAL2215/M083				KD1W/IBAKE	V	KTRY1	KDFW	7.8	JONEZ	CAINE2	ALT
ENY2325/E145				KBMI/IBAKE	V	KTRY1	KDFW	8.4	JONEZ	CAINE2	ALT
AAL1074/M083				KIND/IBAKE	V	KTRY1	KDFW	11.3	JONEZ	CAINE2	ALT
AAL1219/M083				KSLG/MBANO	V	KTRY1	KDFW	-0.5	DEBBE	VKTRY1/1	OK
ENY3697/E145				KPLA/POTTY	V	KTRY1	KDFW	27.1	JONEZ	CAINE2	ALT
ENY3249/E145				KGJT/TURKI	V	KTRY1	KDFW	-0.5	DEBBE	VKTRY1/1	OK
AAL2269/M083				KCOS/TURKI	V	KTRY1	KDFW	7.4	DEBBE	VKTRY1	OK

ENY3198	<ENY3198	35	<AAL2404	35	<AAL2404
DAL667	<DAL667 1	30	AAL2363	30	<AAL2363
GJ54850	<GJ54850 0	25	<ENY3227	25	<ENY3227 1
ASH5787	<ASH5787 1	20	AAL1012	20	<AAL1012
AAL1259	<AAL1259 4	15	AAL1423	15	<AAL1423 1
ENY3249	<ENY3249 3	10	AAL1684	10	<AAL1684 1
AAL2263	<AAL2263 3	5	AAL378	5	<AAL378
AAL2303	<AAL2303 3	0	SWA1234	0	<SWA1234
AAL2215	<AAL2215 5	0	AAL281	0	<AAL281
AAL1291	<AAL1291 5	0	ASH5733	0	<ASH5733
ENY3235	<ENY3235 5	0	SWA1206	0	<SWA1206
AAL1219	<AAL1219 5	0	AAL672	0	<AAL672 1
AAL1135	<AAL1135 5	0	ASQ2820	0	<ASQ2820
ENY3356	<ENY3356 2	0	ENY3346	0	<ENY3346
AAL2269	<AAL2269 2	0	AAL215	0	<AAL215
AAL1074	<AAL1074 1	0	AAL1399	0	<AAL1399
FLG3973	<FLG3973	0	AAL302	0	<AAL302
ASH575A	<ASH575A	0	NKS409	0	<NKS409
ASH5772	<ASH5772	0	NKS469	0	<NKS469
SCN503	<SCN503	0	NKS8608	0	<NKS8608 1
SWA1158	<SWA1158	0	AAL542	0	<AAL542
AAL2305	<AAL2305	0	AAL975	0	<AAL975 1
SWA3281	<SWA3281	0	ASH5789	0	<ASH5789
N425EZ	<N425EZ	0	AAL1098	0	<AAL1098
UAE221	<UAE221	0	AAL1576	0	<AAL1576
ASH5882	<ASH5882	0	ASQ2905	0	<ASQ2905
AAL1395	<AAL1395 2	0	SWA1197	0	<SWA1197
AAL1217	<AAL1217 1	0	AAL2241	0	<AAL2241
JAL12	<JAL12	0	ENY3492	0	<ENY3492
BTO451	<BTO451	0	ASH6263	0	<ASH6263 -1
AAL102	<ASH5784 1	0	SWA9	0	<SWA9
ASH5784	<AAL102 -1	0	ASH5091	0	<ASH5091
		0	ENY3163	0	<ENY3163 2

DE	GC	MF	DE	GC	MF	FE	KN	BO	MF	FE	KN	BO	MF	KA	SA	FI	BF	MF	KA	SA	FI	BR	
All	Runways	1	All	Runways		All	Runways	2		All	Runways	3		All	Runways								

AXXEE	8.6	JEM1	AKXEE	8.6	Altitude	STATUS: Trial Planning
MMANN	8.6	JOVEMS	CHML1	7.6	AAL2215	M083/Z 240
LKNS	8.7	PAWL23	FEWHW	-1.9	AAL2215	KD1W./MC1051010..MC1..ICT..IRN..IBAKE.VKTRY1.KDFW
SEEVK3	8.2	SHAM2	BLTUG	6.9	AAL2215	KD1W./MC1232009..ICT048136..AXXEE.SEEVR3.KDFW
BRDJE	9.0	SHAM2	BRDJE	-0.2		
			PRDND	4.6		

Send Thru Approve Unavailable Cancel Request Accept Reject

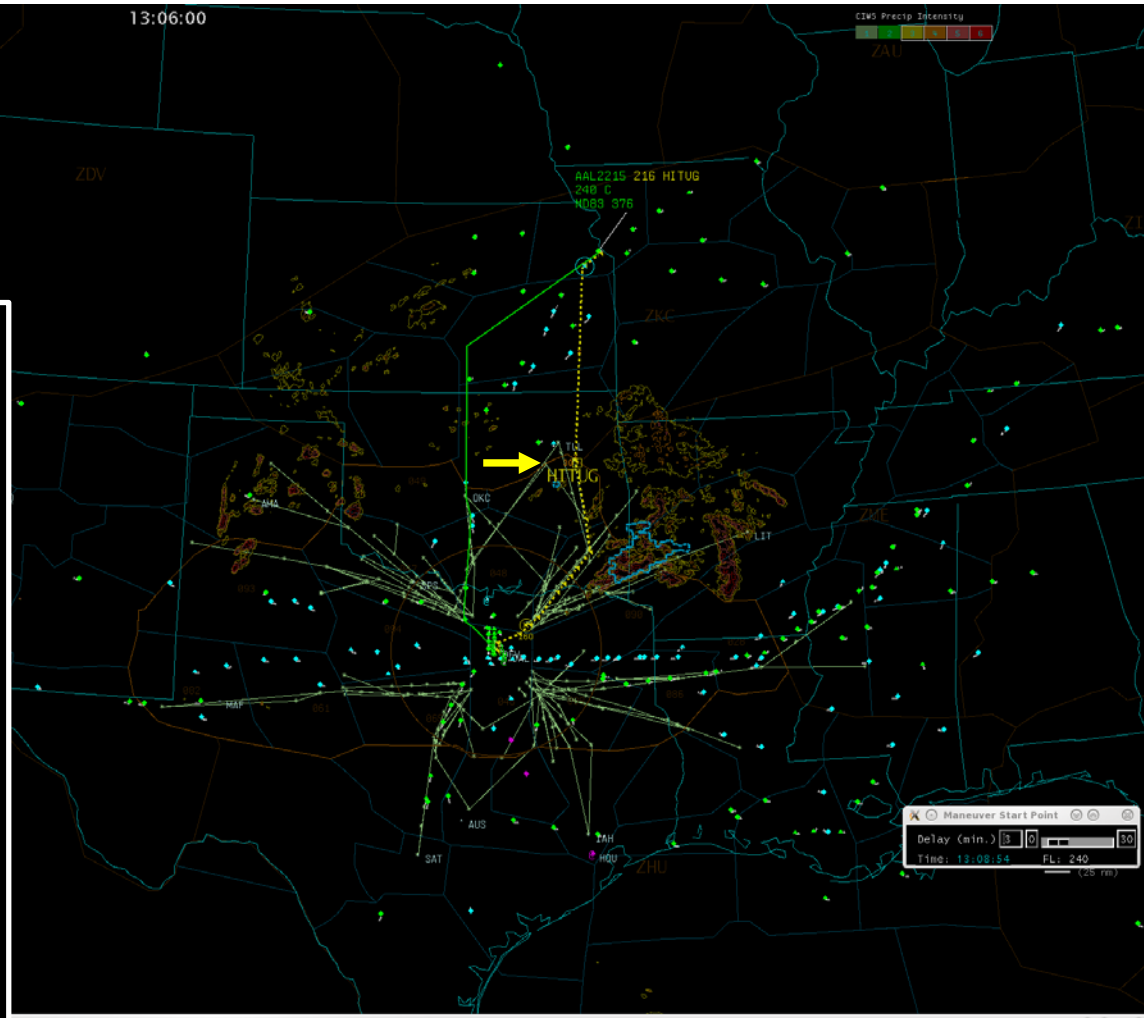
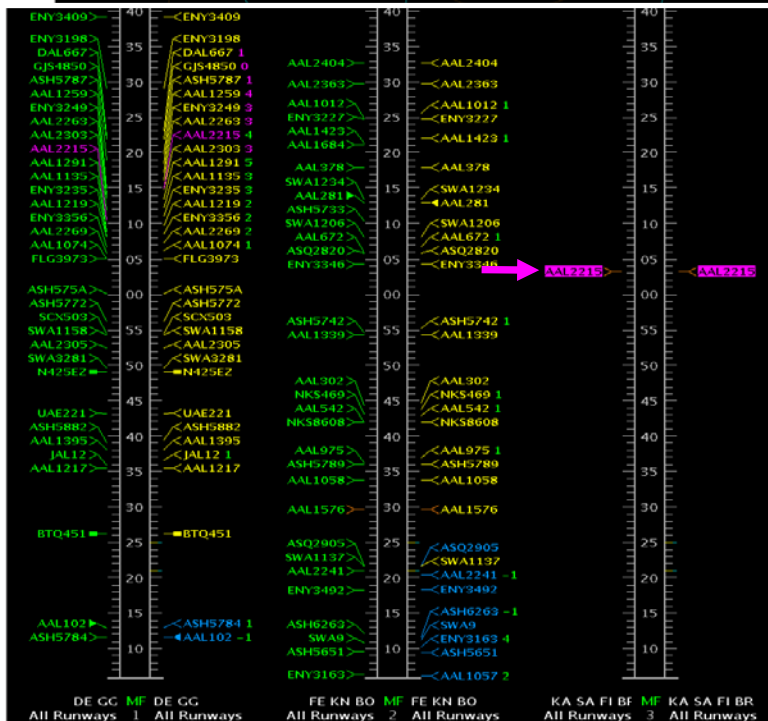
↑ STARS



DRAW Trial Planning: Transition Fix

TL	TP	GP	ACID/TYPE	DEP/TRAN.STAR.DEST	SAV	TRANS.STAR/AUX	STATUS
<input checked="" type="checkbox"/>			DEBBE GREGS	KMDH/HYDES..JFRYE3..KDAL	6.5	AIRRE..CRIKT1	ALT
<input type="checkbox"/>			DAL667/A320	KMSP/HOFFE..VKTRY1..KDFW	6.4	JONEZ..CAINE2	ALT
<input type="checkbox"/>			ENY3407/E145	KCMH/IBAKE..VKTRY1..KDFW	28.9	RRNET..BRDJE3	ALT
<input type="checkbox"/>			GJS4850/CB37	KORD/IBAKE..VKTRY1..KDFW	6.5	JONEZ..CAINE2	ALT
<input type="checkbox"/>			AAL2263/M083	KCMH/IBAKE..VKTRY1..KDFW	12.5	JONEZ..CAINE2	ALT
<input type="checkbox"/>			AAL2303/M083	KORD/IBAKE..VKTRY1..KDFW	5.5	JONEZ..CAINE2	ALT
<input type="checkbox"/>			AAL2215/M083	KDTH/IBAKE..VKTRY1..KDFW	7.8	JONEZ..CAINE2	ALT
<input type="checkbox"/>			ENY3235/E145	KBM1/IBAKE..VKTRY1..KDFW	8.4	JONEZ..CAINE2	ALT
<input type="checkbox"/>			ENY3677/E145	KFJA/POTTY..VKTRY1..KDFW	27.1	JONEZ..CAINE2	ALT
<input type="checkbox"/>			ENY2349/E145	KGDT/TURKI..VKTRY1..KDFW	-0.4	DEBBE..VKTRY1/I	OK
<input type="checkbox"/>			AAL2269/M083	KCOS/TURKI..VKTRY1..KDFW	7.4	DEBBE..VKTRY1	OK
<input type="checkbox"/>			FEVER BOOVE KNEAD				
<input type="checkbox"/>			KARLA BRDJE SASIE FINGR				
<input type="checkbox"/>			HOWDY DODJE ORVLL YEAGR				

13:06:00



ACID	SAV	TRANS	STATUS	DEP	DEST	SAV	TRANS	STATUS
HITUG	6.9	JEN1	Trial Planning	M083/Z	240	KDTH../MCI051010..MCI..ICT..IRW..IBAKE..VKTRY1..KDFW		
SSLID	7.1	JOPM3						
PLEZE	7.1	KLNR2						
CHML1	7.6	PAMLZ3						
JUSSY	7.8	JRHED						
CHICH	8.0	SEEV3						
		SHAM2						
		AYWEE						
		CHML1						
		FEWNN						
		HITUG						
		JRHED						
		PRDMD						
		RRNET						

Transition Fixes

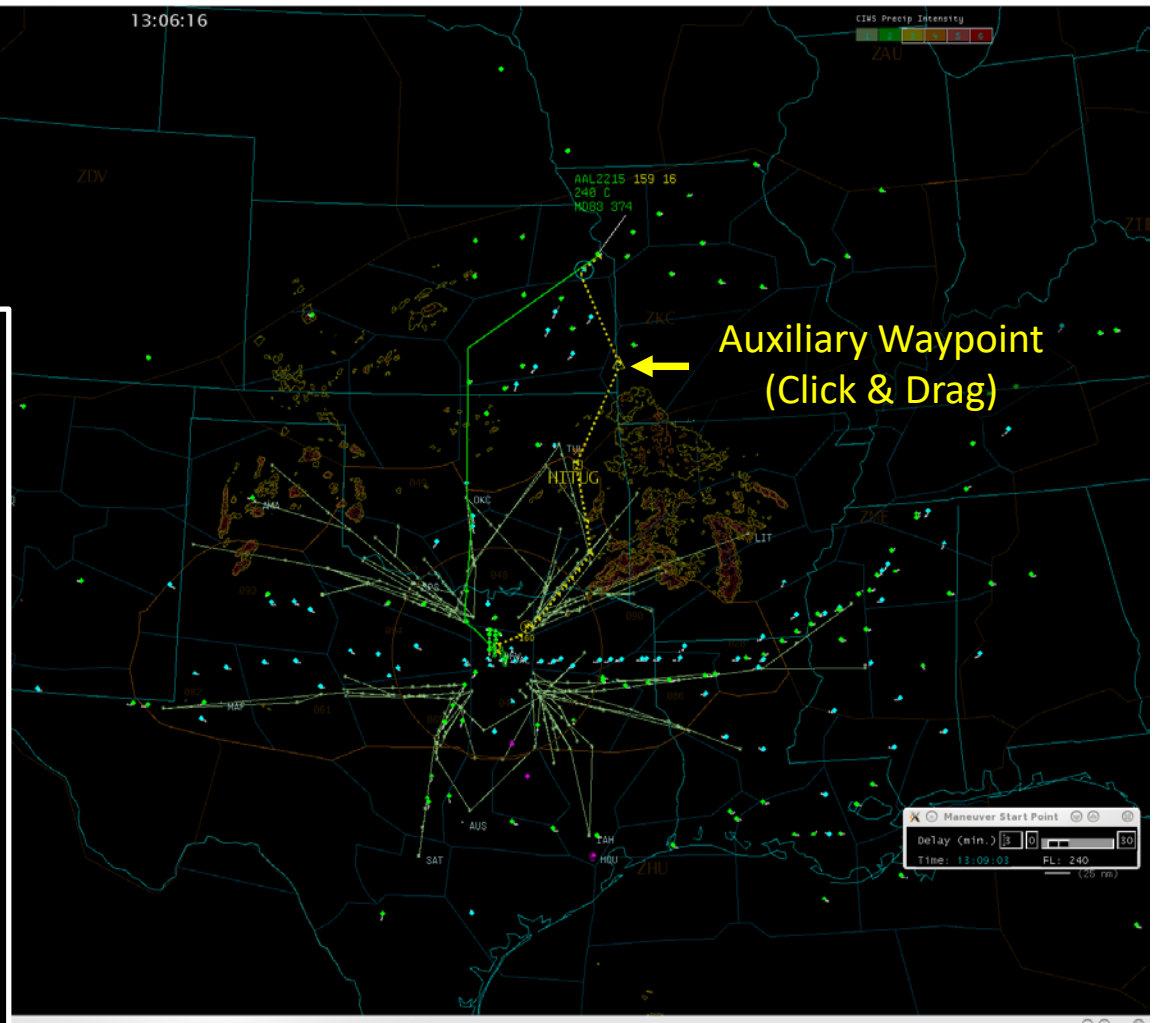


DRAW Trial Planning: Auxiliary Waypoint

TL	TP	GP	ACID/TYP	DEP/TRAN./STAR./DEST	SAV	TRANS./STAR./AUX	STATUS
			DEBBB GREGS 				
			SWA3281/8738	KMDH/HYDES./JFRYE3./KDAL	6.4	AIRRE./CRIKT1	ALT
			DAL667/A320	RMSF/HOFFF./VKTRY1./KDFW	6.4	JONEZ./CAINE2	ALT
			AAL1135/M83	KOSM/HOFFF./VKTRY1./KDFW	5.8	JONEZ./CAINE2	ALT
			ENY3407/E145	KCMI/IBAKE./VKTRY1./KDFW	28.6	JONEZ./CAINE2	ALT
			GJS4850/CRJ7	KORD/IBAKE./VKTRY1./KDFW	6.5	JONEZ./CAINE2	ALT
			ASH5787/CRJ9	KSDF/IBAKE./VKTRY1./KDFW	14.3	JONEZ./CAINE2	ALT
			AAL1259/M82	CVVZ/IBAKE./VKTRY1./KDFW	8.8	JONEZ./CAINE2	ALT
			AAL2203/M83	KCMI/IBAKE./VKTRY1./KDFW	12.5	JONEZ./CAINE2	ALT
			AAL2303/M82	KORD/IBAKE./VKTRY1./KDFW	5.5	JONEZ./CAINE2	ALT
			AAL2215/M83	KDTW/IBAKE./VKTRY1./KDFW	7.8	JONEZ./CAINE2	ALT
			ENY3235/E145	KBMT/IBAKE./VKTRY1./KDFW	8.3	JONEZ./CAINE2	ALT
			AAL1074/M83	KEND/IBAKE./VKTRY1./KDFW	11.0	JONEZ./CAINE2	ALT
			ENY3677/E145	RPJA/POTTY./VKTRY1./KDFW	27.0	JONEZ./CAINE2	ALT
			ENY2490/E145	KGJ/TURKI./VKTRY1./KDFW	-0.4	DEBBB./VKTRY1/1	OK
			AAL1219/M83	KSLC/TURKI./VKTRY1./KDFW	0.3	DEBBB./VKTRY1/1	OK
			AAL2269/M83	KCOS/TURKI./VKTRY1./KDFW	7.4	DEBBB./VKTRY1	OK

13:06:16

A vertical list of waypoints on the left side of the interface. A pink arrow points to the entry 'AAL2215'. The list includes various flight numbers and their corresponding waypoints, such as ENY3198, DAL667, GJS4850, ASH5787, AAL1259, ENY3240, AAL2269, AAL2303, AAL2215, AAL1291, AAL1135, AAL1219, ENY3235, ENY3256, AAL2269, AAL1074, FLG3973, ASH575A, ASH5772, NKS509, SWA1158, AAL2305, SWA3281, N425EZ, UAE221, ASH5882, AAL1995, JAL12, AAL1217, BTQ451, ASH5784, ASH5784, AAL302, NKS469, AAL1339, ASH5742, AAL975, ASH5789, AAL1058, AAL1576, ASQ2905, SWA1137, AAL2241, ENY3492, ASH6263, SWA9, ENY3163, ASH5651, ENY3163.



DE	CG	MF	DE	CG	FE	KN	BO	MF	FE	KN	BO	KA	SA	FI	BF	MF	KA	SA	FI	BR	
All	Runways	1	All	Runways	All	Runways	2	All	Runways	All	Runways	3	All	Runways	3	All	Runways	3	All	Runways	3

HITUG 4.9	JOVEM3	AKXEE 7.1	Altitude	STATUS: Trial Planning	M83/Z 240	KDTW././MCI051010././MCI././ICT././IRW././IBAKE./VKTRY1./KDFW	Full FP All FP Cancel
SSLTD 6.0	CHML1	FEWMM -2.3		AAL2215		KDTW././HITUG004198././ICT048133././HITUG021105././HITUG.SCEVR3./KDFW	
PLTZE 6.2	SHAM2	PROND 3.8					
CHML1 6.5		BRNET 5.6					
JUSST 6.6							
SKTCH 6.7							

Send TNO | Approve | Unable | Cancel Request | Accept | Reject



DRAW Trial Planning: DRAW List Activation

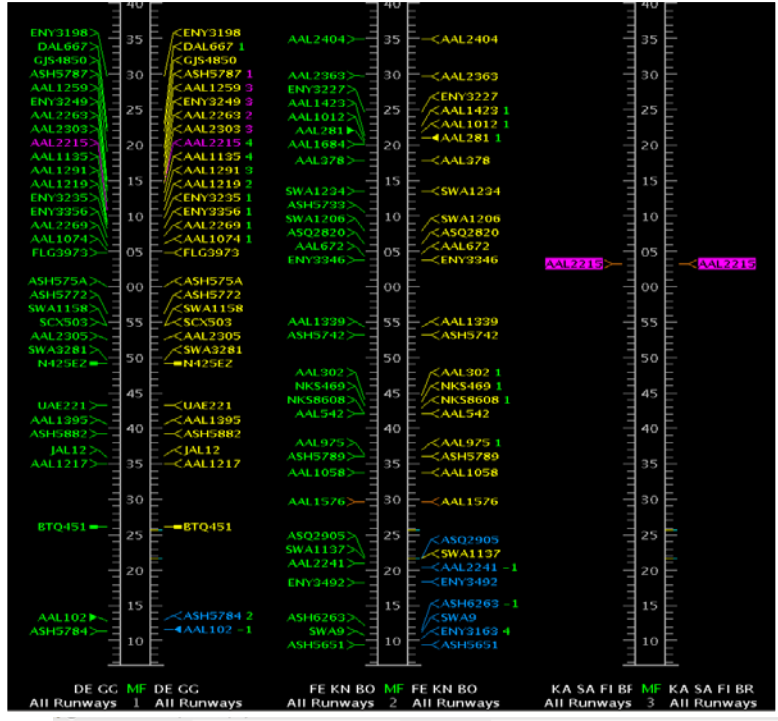
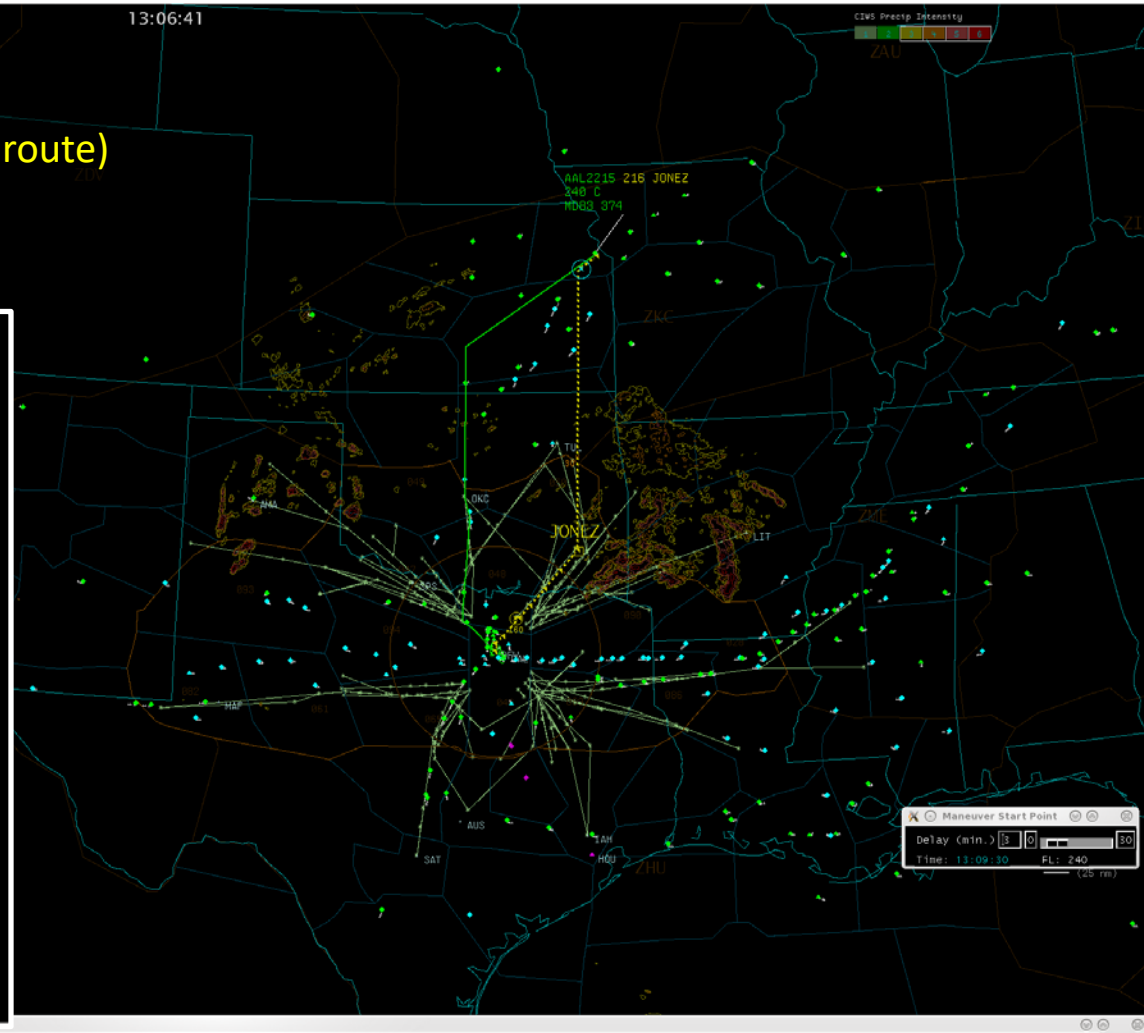
File Edit P-Keys Panels Options Help DWR Alert Criteria: 5 min

13:06:41

DRAW Advisories

TL	GP	ACID/TYPE	DEP/TRAN.STAR.DEST	SAV	TRANS.STAR/AUX	STATUS
		DEBBB GREGS				
<input type="checkbox"/>		SWA3281/B738	KMDH/HYDES..JFVYE2..KDAL	6.2	AIRRE..CRIKT1	ALT
<input type="checkbox"/>		DAL667/A320	KMSP/HOFFF..VKTRY1..KDFH	6.4	JONEZ..CAINE2	ALT
<input type="checkbox"/>		AAL1135/M883	KDSM/HOFFF..VKTRY1..KDFH	5.8	JONEZ..CAINE2	ALT
<input type="checkbox"/>		ENY3227	KDVI/IBAKE..VKTRY1..KDFH	7.5	JONEZ..CAINE2	ALT
<input type="checkbox"/>		GJS4850	KDVI/IBAKE..VKTRY1..KDFH	7.5	JONEZ..CAINE2	ALT
<input type="checkbox"/>		ASH5772	KDVI/IBAKE..VKTRY1..KDFH	7.5	JONEZ..CAINE2	ALT
<input type="checkbox"/>		AAL1259/M882	CVVZ/IBAKE..VKTRY1..KDFH	8.8	JONEZ..CAINE2	ALT
<input type="checkbox"/>		AAL2263/M883	KOMB/IBAKE..VKTRY1..KDFH	12.4	JONEZ..CAINE2	ALT
<input type="checkbox"/>		AAL2303/M882	KOMB/IBAKE..VKTRY1..KDFH	5.3	JONEZ..CAINE2	ALT
<input type="checkbox"/>		AAL2215/M883	KDVI/IBAKE..VKTRY1..KDFH	7.7	JONEZ..CAINE2	ALT
<input type="checkbox"/>		ENY3235/E145	KBML/IBAKE..VKTRY1..KDFH	8.3	JONEZ..CAINE2	ALT
<input type="checkbox"/>		AAL1074/M883	KIND/IBAKE..VKTRY1..KDFH	11.0	JONEZ..CAINE2	ALT
<input type="checkbox"/>		ENY3677/E145	KPIA/POTTV..VKTRY1..KDFH	26.8	JONEZ..CAINE2	ALT
<input type="checkbox"/>		ENY3249/E145	KGJT/TURKI..VKTRY1..KDFH	-0.4	DEBBB..VKTRY1/1	OK
<input type="checkbox"/>		AAL1219/M883	KSLG/TURKI..VKTRY1..KDFH	0.3	DEBBB..VKTRY1/1	OK
<input type="checkbox"/>		AAL2269/M883	KCOS/TURKI..VKTRY1..KDFH	7.3	DEBBB..VKTRY1	OK
		FEVER RODVS KNFA0				

DRAW List Activation (pre-defined route)



DE	CC	MF	DE	CC	FE	KN	BO	MF	FE	KN	BO	KA	SA	FI	BF	MF	KA	SA	FI	BR	
All			All		All				All			All					All				All

Aircraft	Altitude	Status	Flight	Altitude	Status	Flight															
JONEZ	7.7	BRD3E3	CBABY2	Altitude	Trial Planning	AAL2215	M883/Z	240	KDTW./..MC1051010..MCI..ICT..IRW..IBAKE..VKTRY1..KDFH												
DRRTH	8.4	CAINE2																			
PRIZZ	8.8	COY6																			
CATNE	9.2	DANEZ2																			
SASIE	9.4	FINGRS	FONNY2																		

Send TRN Approve Unable Cancel Request Accept Reject



DRAW Trial Planning: Multi-flight Trial Planning

13:07:06

TL	TP	GP	ACID/TYPE	DEP/TRAN.STAR	DEST	SAV	TRANS.STAR/AUX	STATUS	
DEBBB	GREGS								
			SWA3281/6738	KMDW/HYDES	J.FRYES	KDAL	5.9	AIRRE..CRK11	ALT
			DAL667/A320	KMSP/HOFFE	VKTRV1	KDFW	6.3	JONEZ..CAINE2	ALT
			AAL1132/M83	KDMS/HOFFE	VKTRV1	KDFW	5.7	JONEZ..CAINE2	ALT
			ENY3407/E145	KCMJ/IBAKE	VKTRV1	KDFW	28.5	JONEZ..CAINE2	ALT
			GJS4850/CRJ7	KORD/IBAKE	VKTRV1	KDFW	6.3	JONEZ..CAINE2	ALT
			ASH5787/CRJ	KSDF/IBAKE	VKTRV1	KDFW	14.1	JONEZ..CAINE2	ALT
			AAL1259/M8	CYYZ/IBAKE	VKTRV1	KDFW	8.7	JONEZ..CAINE2	ALT
			AAL2263/M8	KCMH/IBAKE	VKTRV1	KDFW	12.2	JONEZ..CAINE2	ALT
			AAL2303/M8	KORD/IBAKE	VKTRV1	KDFW	5.3	JONEZ..CAINE2	ALT
			AAL2215/M8	KDTW/IBAKE	VKTRV1	KDFW	7.5	JONEZ..CAINE2	ALT
			ENY3235/E14	KEMI/IBAKE	VKTRV1	KDFW	8.2	JONEZ..CAINE2	ALT
			AAL1074/M8	KIND/IBAKE	VKTRV1	KDFW	10.9	JONEZ..CAINE2	ALT
			ENY3677/E145	KPIA/POTTI	VKTRV1	KDFW	26.7	JONEZ..CAINE2	ALT
			ENY3249/E145	KGJT/TURKI	VKTRV1	KDFW	-0.4	DEBBB..VKTRY1/1	OK
			AAL1219/M83	KSLG/TURKI	VKTRV1	KDFW	2.7	DEBBB..VKTRY1/1	OK
			AAL2269/M83	KCOS/TURKI	VKTRV1	KDFW	7.2	DEBBB..VKTRY1	OK
			FEVER	BOOVE	RLEAD				

TP	ACID/TYPE	DEP/DST	SAV	FIX/AUX	TR	SC	MX	TMI	RM
	AAL2215/M83	KDTW/KDFW	7.5	JONEZ	OK	OK			
	AAL1074/M83	KIND/KDFW	10.9	JONEZ	OK	OK			
	ENY3235/E145	KEMI/KDFW	8.2	JONEZ	OK	OK			
	AAL2303/M82	KORD/KDFW	5.3	JONEZ	OK	OK			
	AAL2263/M83	KCMH/KDFW	12.2	JONEZ	OK	OK			
	AAL1259/M82	CYYZ/KDFW	8.7	JONEZ	OK	OK			
	ASH5787/CRJ9	KSDF/KDFW	14.1	JONEZ	OK	OK			

TP	ACID/TYPE	DEP/DST	SAV	FIX/AUX	TR	SC	MX	TMI	RM	
	AAL2215	M83/Z	240	KDTW./..MC1051010..	..MCI..	..ICT..	..IRM..	..IBAKE	..VKTRV1	..KDFW
	AAL2215			KDTW./..MC1231016..	..ICT048129..	..JONEZ	..CAINE2	..KDFW		

Altitude:

STATUS: Trial Planning

Buttons: [Send TRM] [Approve] [Unable] [Cancel Request] [Accept] [Reject]

Maneuver Start Point

Delay (min.):

Time: 13:10:06 FL: 240 (25 nm)

DE	GC	MF	DE	GC	FE	KN	BO	MF	FE	KN	BO	KA	SA	FI	BF	MF	KA	SA	FI	BR			
All	Runways	1	All	Runways	1	All	Runways	2	All	Runways	2	All	Runways	3	All	Runways	3	All	Runways	3	All	Runways	3

TP	ACID/TYPE	DEP/DST	SAV	FIX/AUX	TR	SC	MX	TMI	RM	
	JONEZ	7.5	BRD3E3	CABBY2						
	DRRH	8.2	CAINE2							
	PRIZZ	8.7	COVB							
	CAINE	9.0	DWMC22							
	SASTI	9.3	FINGR5	FORNY2						

Buttons: [Full FP] [All FP] [Cancel]



	HITL #1	HITL #2	HITL #3	HITL #4
Month	May 2017	October 2017	April-May 2018	Oct-Nov 2018
Arrival Metering	SW DFW arrivals in ZFW	NW & SW DFW arrivals in DFW	SW & SE ATL arrivals in ZTL	SE ATL arrivals in ZTL & ZJX
DRAW vs. No-DRAW	X	X		X
# of Weather Scenarios	4	2	4	2
# of TMCs	4	4	4	2+2
# of Sectors	5	7	7	6
Reroute Coordination	Auto	Auto	Auto	Auto + Manual
Notes	First end-to-end TMC->metering fix DRAW study 6 Storyboard runs	TMC and Controller sessions on separate days, 16 TMC-Only runs	New airspace and improved metering procedures	Included ZJX controllers and consulting ZJX TMC Improved ERAM metering support



DRAW Status and Next Steps

- CTAS Version
 - Developed DRAW concept and core functionality
 - Completed 4 TMC-Controller in the loop simulations with arrival metering
 - Refined user interface and demonstrated acceptable controller and TMC workload
 - Demonstrated reduction in tactical Wx avoidance in arrival airspace
 - Completed closed loop simulations to explore DRAW mitigation of a wider variety of weather conditions and traffic impacts
- TBFM 4.7 Version
 - Integration of DRAW functionality
 - Arrival Metering (Q2FY19)... currently debugging
 - Extended Metering/Coupled Scheduling (Q4FY19)
 - DRAW-TBFM HitL simulation (July 2019)
 - TBFM DRAW Arrival Metering Study
 - TMCs Only (no controllers)
 - All DFW arrivals flows with variety of weather conditions and traffic loading



Questions?

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Backup Slides