MACS Data Collection and Data Analysis

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Outline

- Data Collection Setup panel
- Types of Logs
- Location of MACS Data
- Other Influencing Factors
- Real-Time Analysis Tools
- Post-Processing Analysis Tools

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Data Collection Setup Panel

Location: Windows -> Setup Panels -> Data Collection

MACS Data Collection Setup

File Address C:\Experiments\Corridors\MacsSetup\hwasoo.dataCollection

Control | ATC State log | Custom log

Notes on Data Collection

Data Collection Items can be turned on and off on this panel. Several events can be cusomized from here.
Not all data collection items are available in all operator modes.
Greyed out items are not available in the mode you are currently running.
Data collection files are typically opened and closed when a simulation is started and stopped unless you check 'Keep Data Collection Running'

The data collection files can be found in: C:/Experiments/TestOutput/Corridors/DATA/

Data Collection Main Mode

- (●) Start/Stop Data Collection when MACS Simulation start/stops
- ( ) Keep Data Collection Running
- [x] SISO Logging to new files Controller Name DEFAULT

General Use Data Collection Items

- [ ] Flight State (periodic) — [ ] include flight plan FlightState log rate (seconds): 12 Max Limit of Aircraft: 999 — File: ELBA_Macs_FlightState_plan_b_YYYY-MM-DD_HH-MM-SS.log
- [x] Customized Events — File: ELBA_Macs_Custom_plan_b_YYYY-MM-DD_HH-MM-SS.log

Flight Deck Data Collection Items

- [ ] Pilot Inputs and Flight Deck Events — File: ELBA_Macs_Pilot_plan_b_YYYY-MM-DD_HH-MM-SS.log
- [ ] FMS Trajectories — File: ELBA_Macs_Traj_plan_b_YYYY-MM-DD_HH-MM-SS.log

Air Traffic Control Data Collection Items

- [x] Controller Inputs and ATC events — File: ELBA_Macs_Atc_plan_b_YYYY-MM-DD_HH-MM-SS.log
- [x] ATC State items (sector counts,etc.) — File: ELBA_Macs_AtcState_plan_b_YYYY-MM-DD_HH-MM-SS.log
- [x] ATC trajectory predictions (periodic) — Trajectory log rate (seconds): 120 — File: ELBA_Macs_AtcTraj_plan_b_YYYY-MM-DD_HH-MM-SS.log
- [x] ATC Trajectory Modifications (trial plans) — File: ELBA_Macs_TrajMod_plan_b_YYYY-MM-DD_HH-MM-SS.log
- [ ] ATC TimeLine events — File: ELBA_Macs_Timeline_plan_b_YYYY-MM-DD_HH-MM-SS.log
- [x] ATC Traffic Load events — File: ELBA_Macs_TrafficLoad_plan_b_YYYY-MM-DD_HH-MM-SS.log
- [ ] ATC TSafe events — File: ELBA_Macs_TSafe_plan_b_YYYY-MM-DD_HH-MM-SS.log
- [x] Sector Crossing Events — File: ELBA_Macs_Sector_Crossing_plan_b_YYYY-MM-DD_HH-MM-SS.log

Special Use Ground Side Automation Data Collection Items

- [x] Complexity Metrics — File: ELBA_Macs_CompMet_plan_b_YYYY-MM-DD_HH-MM-SS.log
- [x] Conflict Resolution Website SQL (AAC) — Files: aac/*.csv aac/*.prop

Simulation Time Ac Changes by SimManager

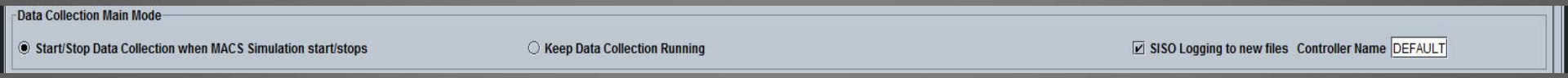
- [x] Save sim time ac changes — File: ELBA_SimChanges_plan_b_YYYY-MM-DD_HH-MM-SS.log

DSR Mouse Events

- [x] DSR Mouse Events — File: ELBA_MouseEvents_plan_b_YYYY-MM-DD_HH-MM-SS.log

Data Collection Setup Panel

- Data collection “modes”
  - Start/stop data collection when MACS simulation start/stop
  - Keep data collection running



Outline

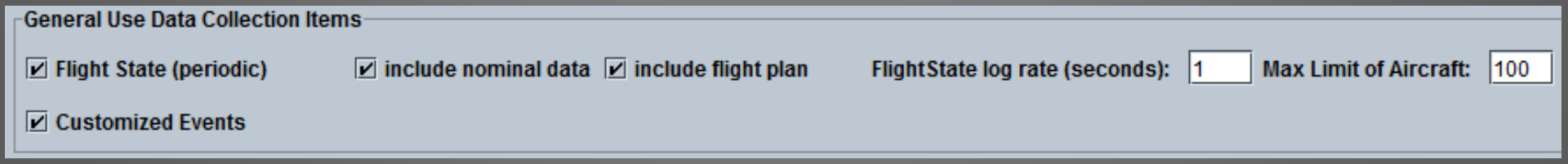
- Data Collection Setup panel
- Types of Logs
- Location of MACS Data
- Other Influencing Factors
- Real-Time Analysis Tools
- Post-Processing Analysis Tools

Types of Logs

- What can MACS collect?
  - System-wide “general use” data
  - Flight Deck data
  - ATC data
  - Special Use ATC Automation data
  - Real-time Sim Manager changes to aircraft
  - DSR Mouse/Trackball data

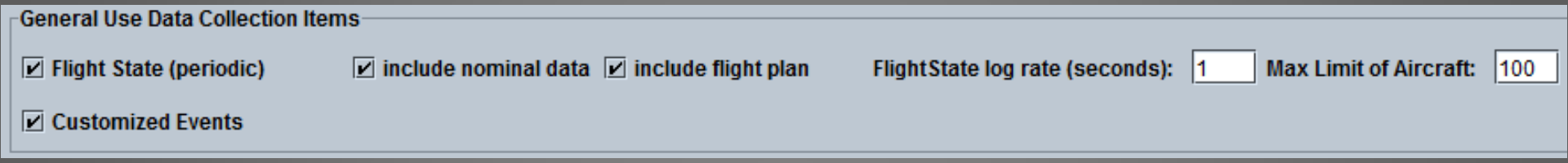
Types of Logs

- What can MACS collect?
  - System-wide, “general use” data:
    - Flight State log (…Macs_FlightState…)
      - Logs the state information of every aircraft every X seconds
    - Custom log (…Macs_Custom…)
      - User-customizable log to record only the EVENTS you’re interested in
        - » Can include any events available in the pilot event log, controller event log, and ATC state log



Types of Logs

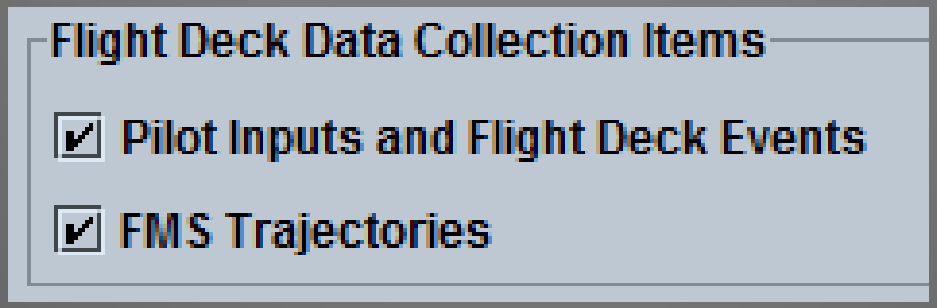
- Splitting of logs



atcmp11_Macs_Custom_view__2011-10-04_10-35-05.log	Oct 14, 2011 7:44 PM	3.9 MB	Log File
atcmp11_Macs_FlightState_view_1_2011-10-04_10-35-05.log	Oct 14, 2011 7:43 PM	40.8 MB	Log File
atcmp11_Macs_FlightState_view_2_2011-10-04_10-35-05.log	Oct 14, 2011 7:42 PM	53.5 MB	Log File
atcmp11_Macs_FlightState_view_3_2011-10-04_10-35-05.log	Oct 14, 2011 7:44 PM	36.3 MB	Log File
atcmp11_Macs_FlightState_view_4_2011-10-04_10-35-05.log	Oct 14, 2011 7:43 PM	15.7 MB	Log File
atcmp11_Macs_FlightState_view_5_2011-10-04_10-35-05.log	Oct 14, 2011 7:41 PM	143 KB	Log File
atcmp11_Macs_SectorCrossing_view__2011-10-04_10-35-05.log	Oct 14, 2011 7:44 PM	463 KB	Log File

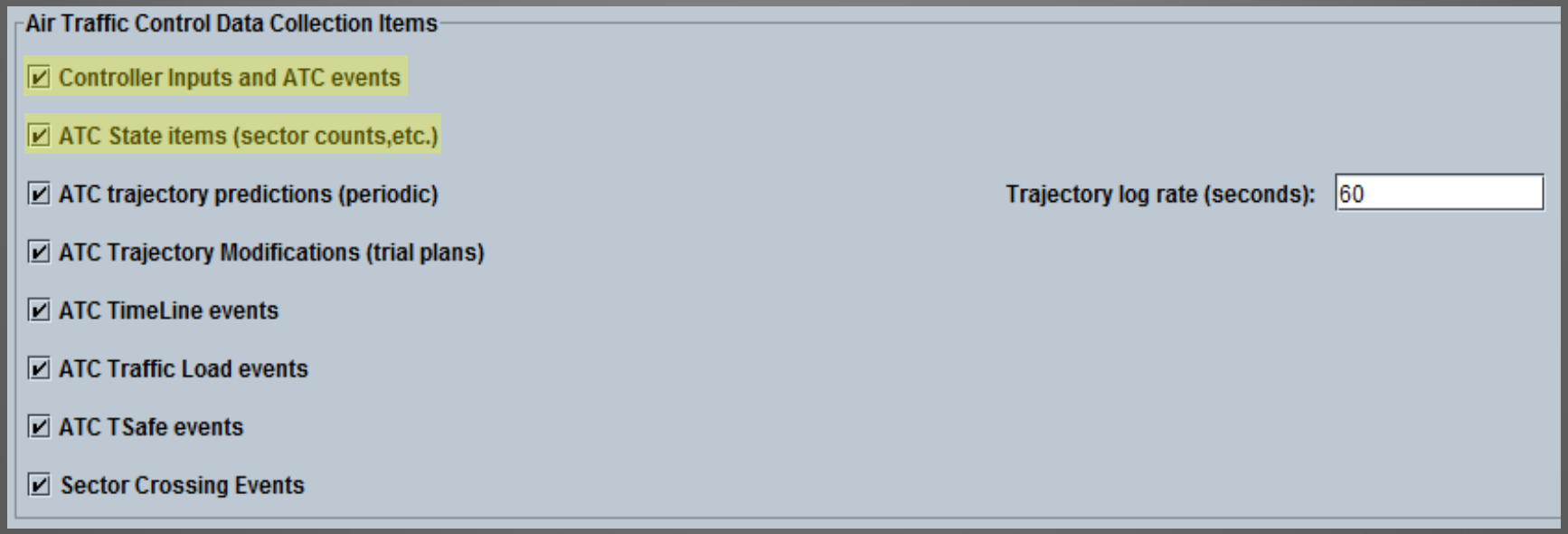
Types of Logs

- What can MACS collect?
  - Flight Deck data:
    - Pilot event log (…Macs_Pilot…)
      - Logs the state information of an aircraft at the time of a pilot input or flight deck event
    - FMS Trajectories log (…Macs_Traj…)
      - Logs the trajectories computed by the FMS



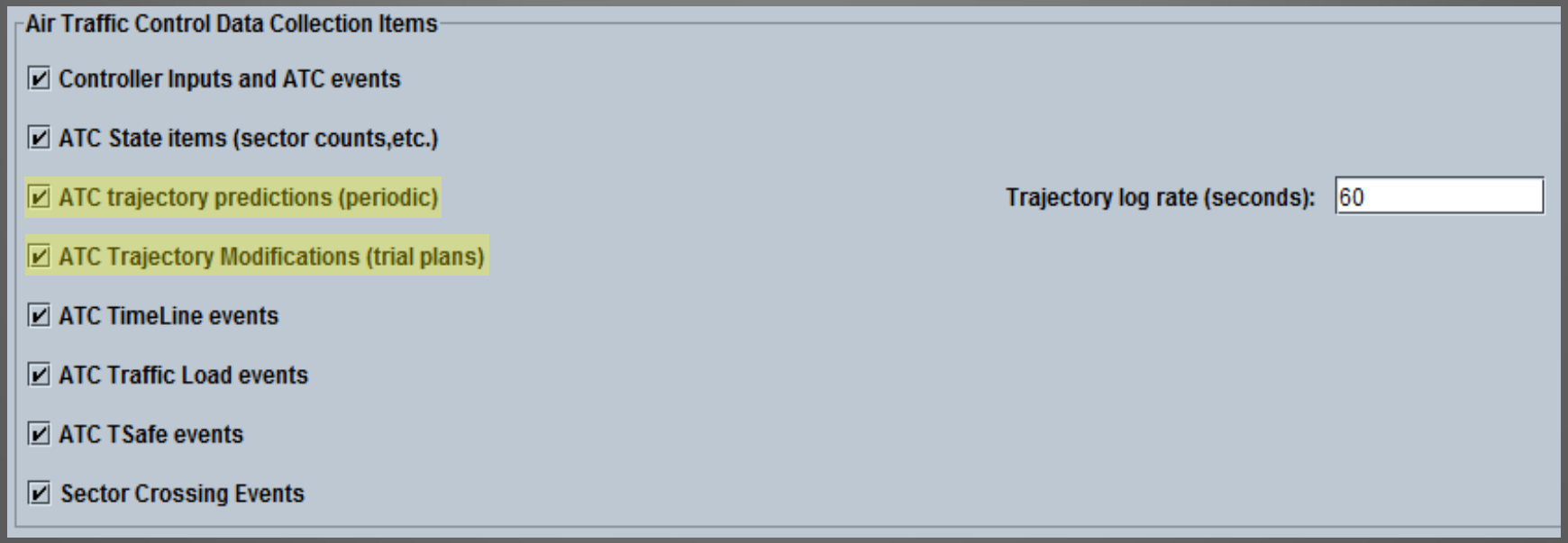
Types of Logs

- What can MACS collect?
  - ATC data:
    - Controller event log (…Macs_Atc…)
      - Logs the state information of an aircraft at the time of a controller input or ATC event
    - ATC State log
      - Logs system-wide ATC data
        - » Sector counts, conflicts and separation violations, fix crossings, etc.



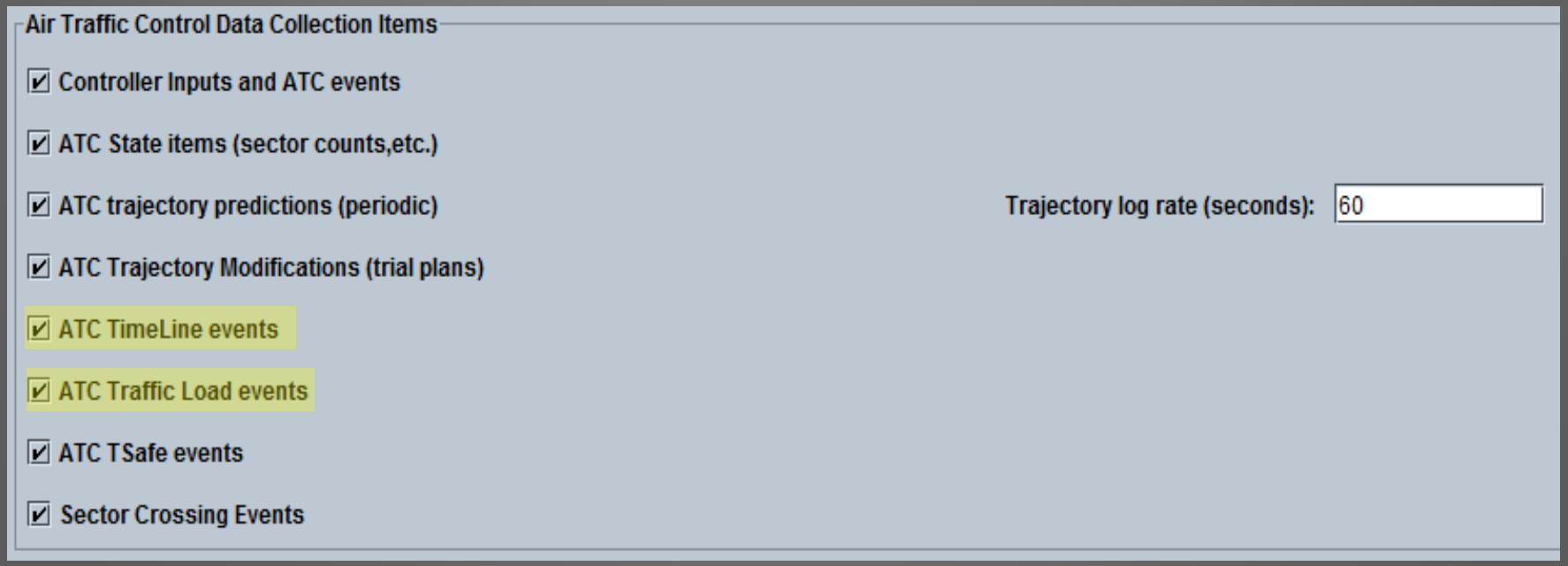
Types of Logs

- What can MACS collect?
  - ATC data (continued):
    - ATC Trajectory log (…Macs_AtcTraj…)
      - Logs the trajectories computed by the ATC ground system for every aircraft every X seconds
    - ATC Trajectory Modifications log (…MACS_TrajMod…)
      - Logs trajectories associated with trial plans created by controllers and the automation



Types of Logs

- What can MACS collect?
  - ATC data (continued):
    - ATC Timeline/Meterlist log (…Macs_TimelineMeterList…)
      - Logs the ETAs and STAS of all aircraft scheduled on any available timeline
    - ATC Traffic Load log (…MACS_TrafficLoad…)
      - Logs all data displayed in the load tables and load graphs
      - Logs operator interactions with load tables and load graphs

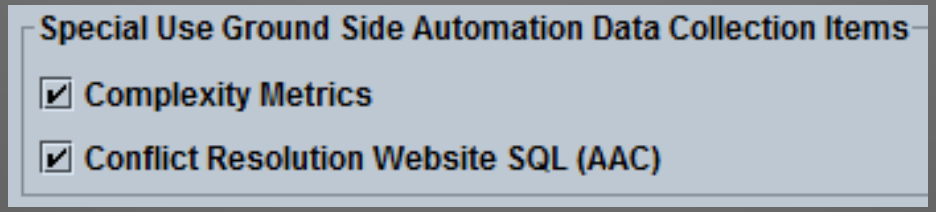


Types of Logs

- What can MACS collect?
  - ATC data (continued):
    - ATC TSAFE log (…Macs_TSafe…)
      - Logs the resolution advisory and the uplinked resolution for all TSAFE events
      - Logs 5 minutes of aircraft flight state information for all aircraft receiving a TSAFE resolution
    - ATC Sector Crossing log (…MACS_Sector_Crossing…)
      - Logs all sector crossing events for all aircraft
      - Forces a new FMS and ATC trajectory to be computed at the time of each sector crossing
      - Computes and logs time/distance flown in sector summary data

Types of Logs

- What can MACS collect?
  - Special Use ATC Automation data:
    - Complexity Metrics log (…Macs_CompMet…)
      - Logs the sector characteristics for each sector owned by the local workstation
      - Logs the summary data of the ATC situation every minute
      - Logs the flight state data for all aircraft included in the ATC situation every minute
      - Logs the workload data pressed by the controller
      - Logs a forced computation of the sector characteristics and the summary data of the ATC situation at the time of any boundary change
      - Logs the traffic load's complexity values every minute across 5-minute intervals for all owned sectors
    - AAC Conflict Resolution SQL data logs (*.csv, *.prop)
      - Logs all information necessary to use a web-based SQL analysis
      - http://airtrafficconflictresolutions.arc.nasa.gov/

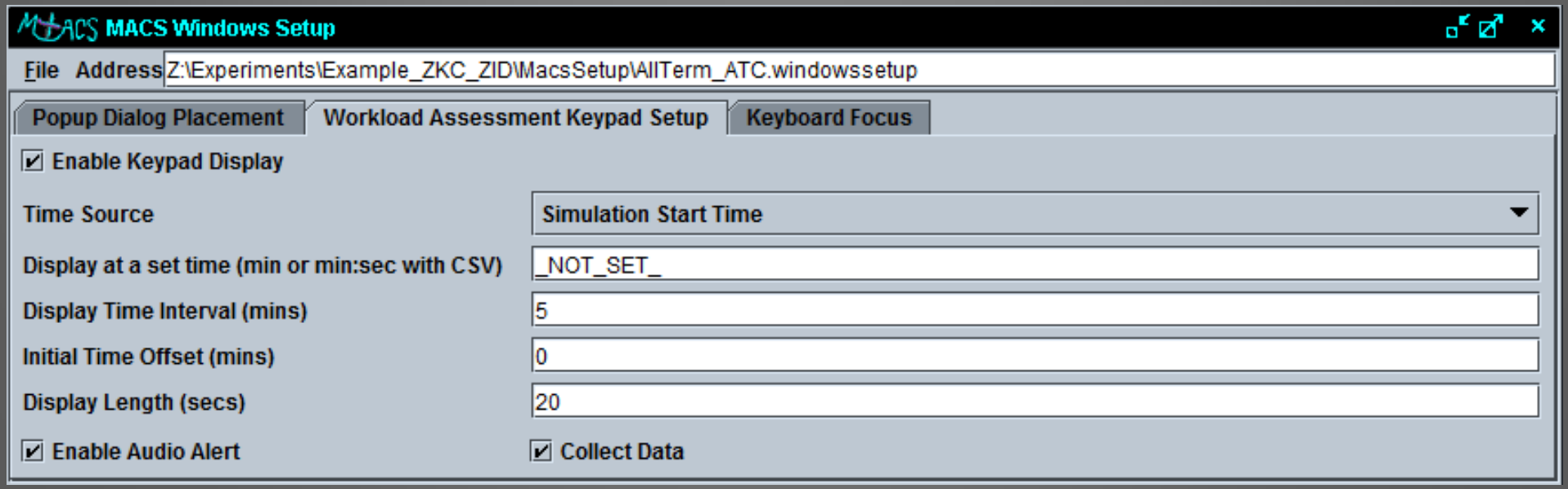


Types of Logs

- What can MACS collect?
  - Real-time Sim Manager changes to aircraft:
    - Sim Time AC Changes log (…SimChanges…)
      - Logs changes made in real-time to any aircraft by the sim manager
        - » Duplicate any aircraft, to be inserted in the simulation 5 minutes from now
        - » Modify an inactive aircraft
        - » Delete any aircraft
  - DSR Mouse/Trackball data:
    - DSR Mouse Events log (…MACS_MouseEvent…)
      - Logs all mouse/trackball button press and button release events
      - Only applies to operator actions made in the DSR

Types of Logs

- Wait! Here's one more…
  - Workload Assessment Keypad data
    - Workload log (…Wkload…)
      - Logs the real-time workload ratings of participants
      - On a 1-6 scale, every X interval
      - NOT controlled by the Data Collection Setup panel, but by the MACS Windows Setup panel (Windows -> Setup Panels -> MACS Windows Setup)



Types of Logs

- How many was that?
  - 17
  - Event-driven (15):
    - Custom log
    - Pilot Event log
    - FMS Trajectory log
    - Controller Event log
    - ATC State log*
    - ATC Trajectory Modifications log
    - Timeline/Meterlist log
    - Traffic Load log*
    - TSAFE log
    - Sector Crossing log
    - Complexity log*
    - AAC log
    - Sim Changes log
    - Mouse Events log
    - Workload log
  - Periodic/Interval-driven (5):
    - Flight State log
    - ATC State log*
    - ATC Trajectory log
    - Traffic Load log*
    - Complexity log*

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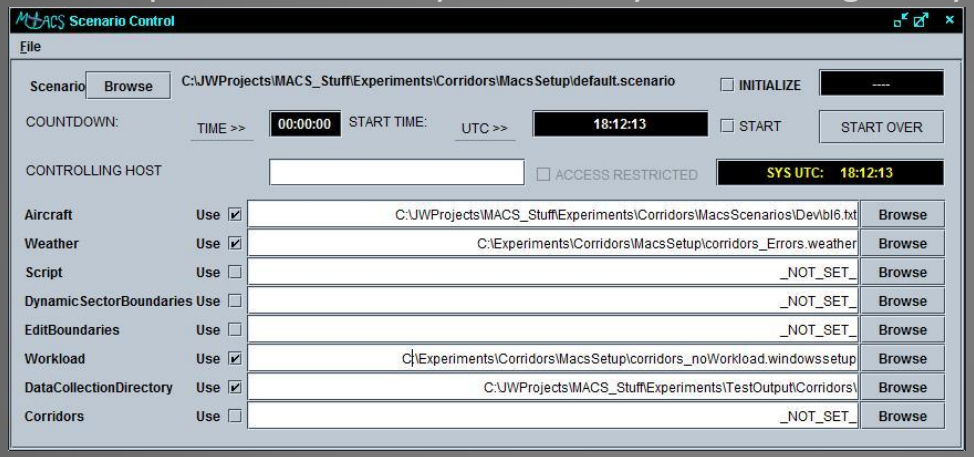
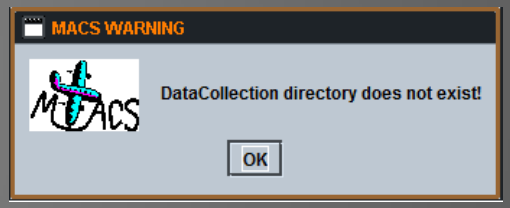
Location of MACS Data

- Where will my data be written?
  - Typically controlled by the Scenario Control panel
    - Location: Windows -> External Admin Tools -> Scenario Control
    - Allows the researcher to specify where the data should be written
    - If specified directory is invalid, you will not get any data!





  - Can also be controlled by the Properties file:

```
##################################################
## directory for Macs data collection (DataCollectionDirectory)
DataCollectionDirectory = Z:/DATA/Example_ZKC_ZID/
```

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Other Influencing Factors

- Output rate parameter from Flight Deck Setup panel does NOT affect your data
  - Designed to impacts ADRS message communication
- State source selection will indirectly affect your data
  - Surveillance data of differing quality

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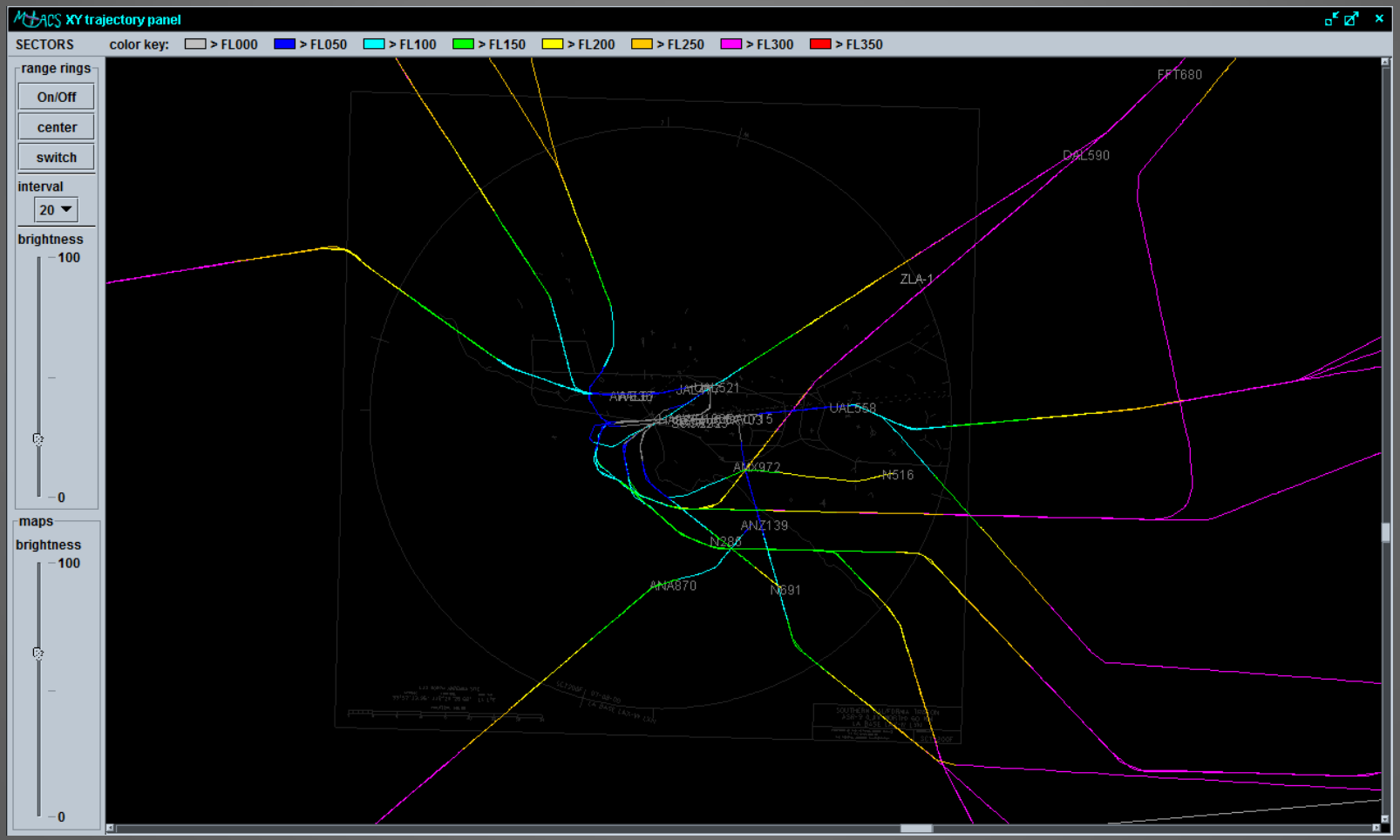
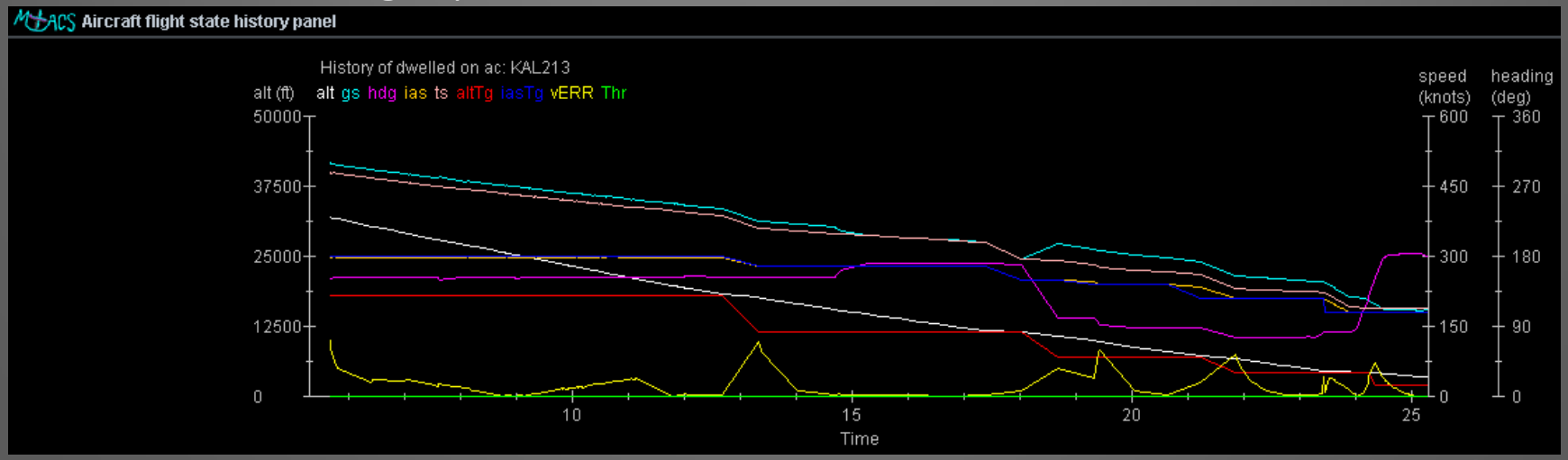
Real-Time Analysis Tools

- XY Trajectory Panel
  - Location: Windows -> Analysis Views -> XY Trajectory Panel



Real-Time Analysis Tools

- Aircraft Flight State History Panel
  - Location: Windows -> Analysis Views -> Aircraft XY Trajectory Panel
    - Real-time monitoring of aircraft flight state:
      - Altitude
      - Ground speed
      - Heading
      - Indicated airspeed
      - Target speed
      - Altitude Target
      - Indicated Air Speed Target
      - Vertical Error
      - Thrust*



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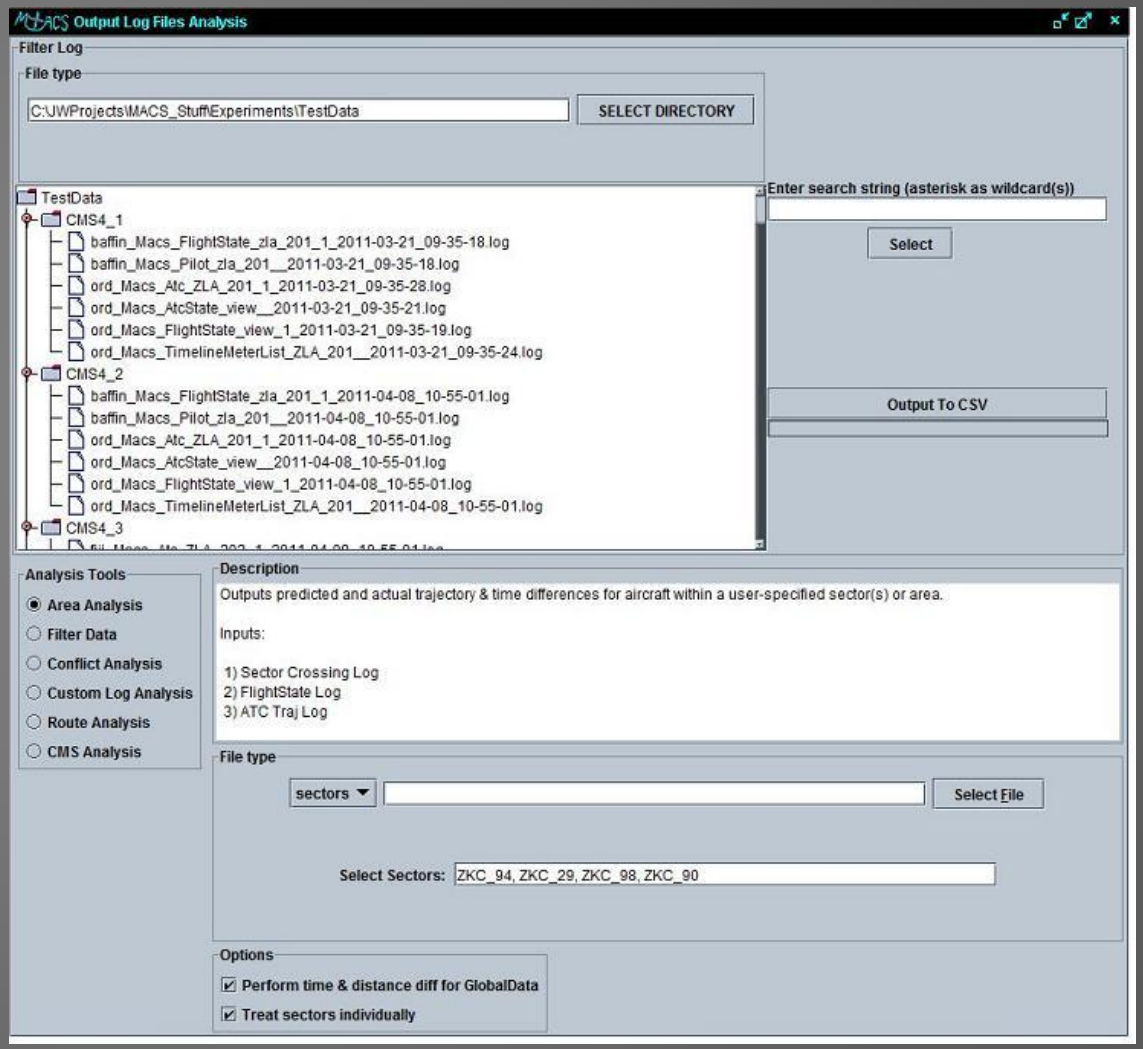
Post-Processing Data Analysis Tools

- Location: Windows -> Analysis Views -> Output Log Files Analysis

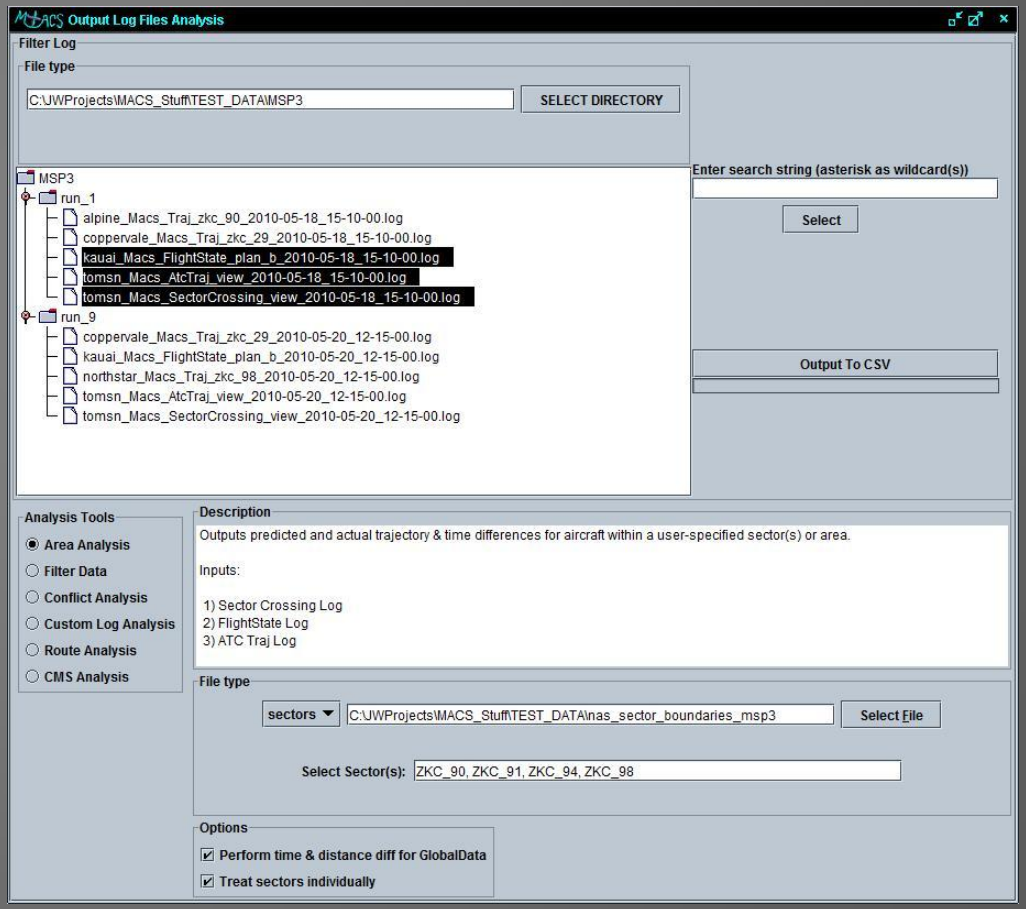
- Operating Modes:
  - Observer
  - Analyst
  - Developer
  - Developer-Lite

- Tools:
  - Area Analysis
  - Filter Data
  - Conflict Analysis
  - Custom Log Analysis
  - Route Analysis
  - CMS Analysis



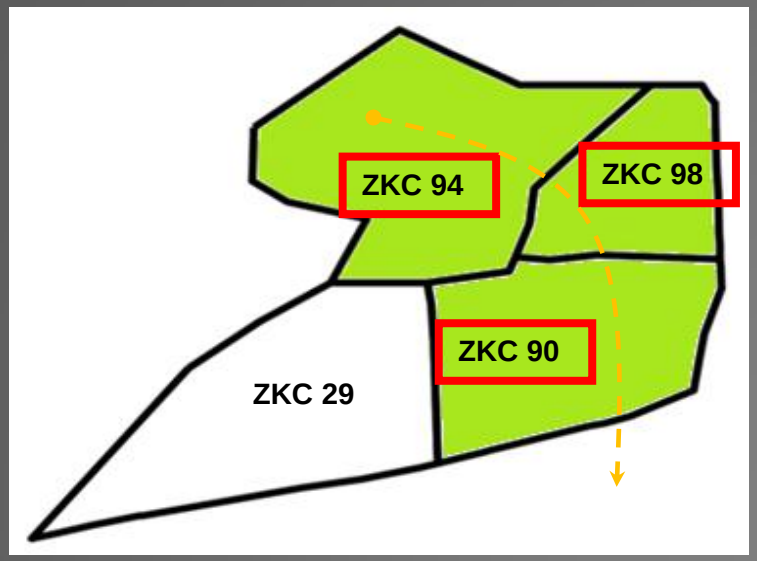
Area Analysis Tool

- Outputs predicted and actual trajectory & time differences for aircraft within a user-specified sector(s) or area
- Input:
  - Sector Crossing Log File
  - FlightState Log File
  - ATC Trajectory Log File

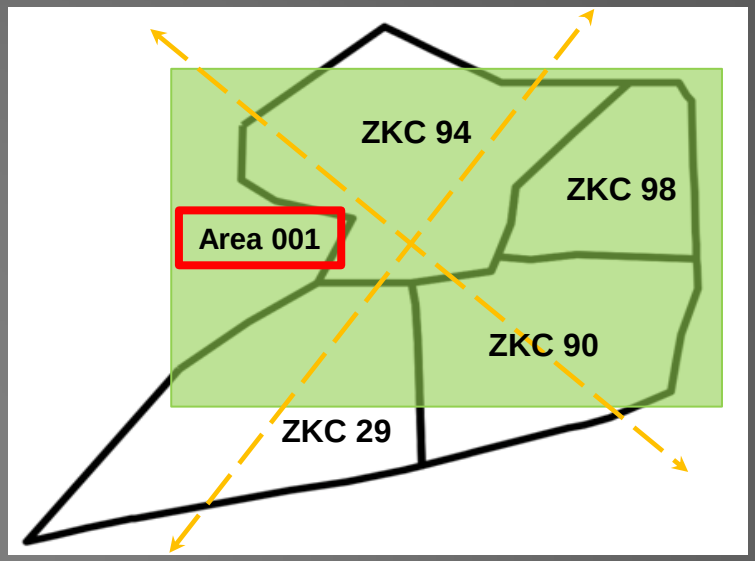


Area Analysis Tool

Sector Analysis



Box Analysis

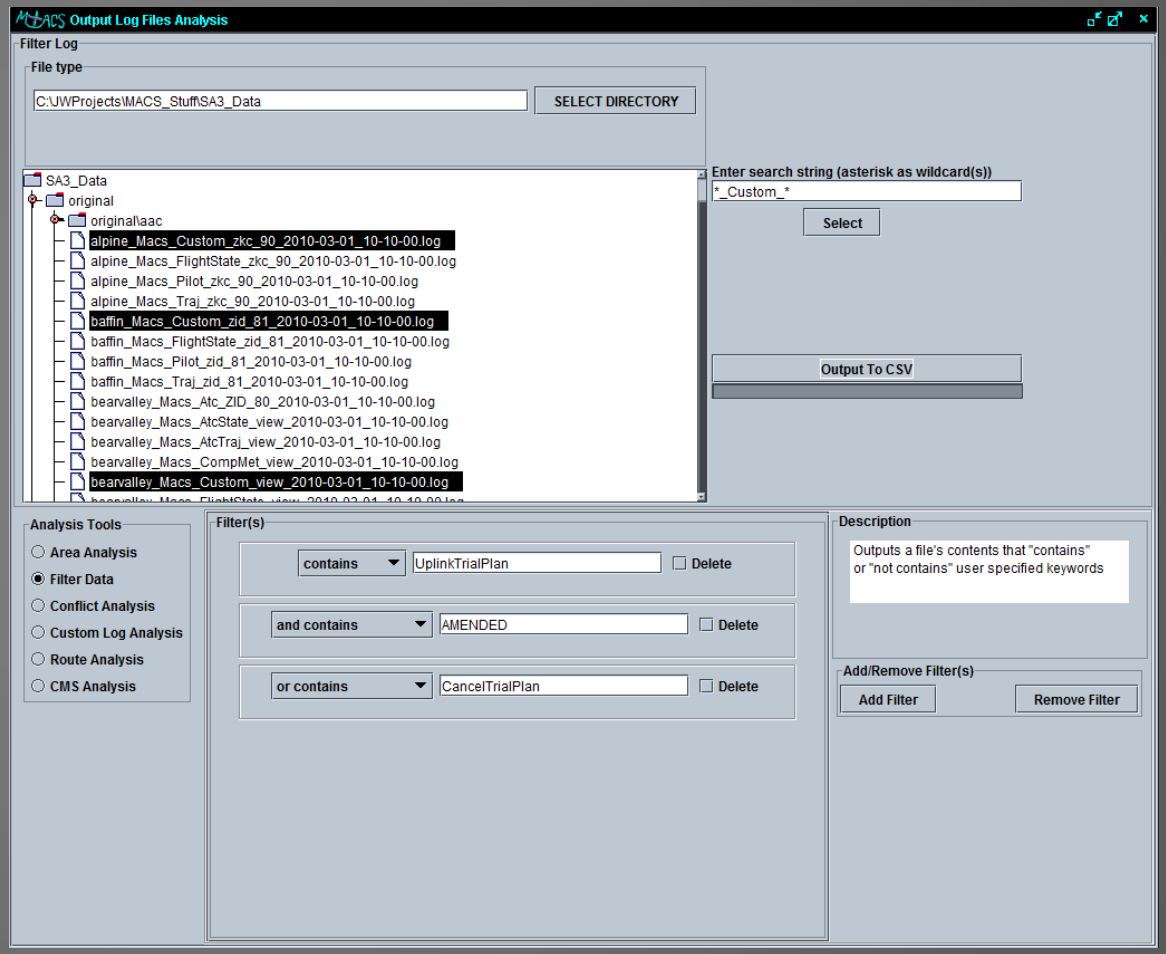


- Output:
  - Aircraft timeline through sector or area
  - Path and time differences through sector or area

location	ATC_TRAJ	Sector	callsign	time	GLOBAL_MAP Path Difference	EVENT_TYPE Time Difference	UTC_TIME	REL_TIME
IN	fiji_Macs_	ZKC_94	UAL576	19:05:21	GLOBAL_DATA	PredictedAtcTraje	19:05:21	20
EXIT	fiji_Macs_	ZKC_94	UAL576	19:09:23	GLOBAL_DATA	PredictedAtcTraje	19:09:23	262
ENTER	fiji_Macs_	ZKC_98	UAL576	19:09:23	GLOBAL_DATA	PredictedAtcTraje	19:09:23	262
EXIT	fiji_Macs_	ZKC_98	UAL576	19:14:26	GLOBAL_DATA	PredictedAtcTraje	19:14:26	565
ENTER	fiji_Macs_	ZKC_90	UAL576	19:14:26	GLOBAL_DATA	PredictedAtcTraje	19:14:26	565
EXIT	fiji_Macs_	ZKC_90	UAL576	19:16:27	GLOBAL_DATA	PredictedAtcTraje	19:16:27	687
ENTER	fiji_Macs_	ZKC_31	UAL576	19:16:27	GLOBAL_DATA	PredictedAtcTraje	19:16:27	687
DIFF	fiji_Macs_	enter_ZKC_98_exit_ZKC_98	UAL576		0.6559601	-18		
DIFF	fiji_Macs_	enter_ZKC_90_exit_ZKC_90	UAL576		-7.935211	-10		

Filter Data Tool

- Filter text from multiple files into one file
  - Filter options:
    1. Contains
    2. And contains
    3. Or contains
    4. And does not contain



Filter Data Tool

- Input:
  - any text based files (i.e.. Log files, ASCII files)

- Sample Output:

File Source	Data												
bearvalley_Macs_	CancelTrialPlan_a	cancel trial planning	74	18:11:14	11:14.5	SAY210	B777	ZAU_44	ZAU_44	OVRFL	1		TFR
bearvalley_Macs_	CancelTrialPlan_a	cancel trial planning	90	18:11:30	11:30.1	SWA112	B75C	ZID_80	ZID_80	OVRFL	1		TFR
bearvalley_Macs_	CancelTrialPlan_a	cancel trial planning	104	18:11:44	11:44.9	NWA761	B75C	ZID_80	ZID_80	OVRFL	1		TFR
bearvalley_Macs_	UplinkTrialPlan_a	UPLINK CLEARANCE ; ;NWA761ROUTE AMENDED EWR./.39424	104	18:11:44	11:44.9	NWA761	B75C	ZID_80	ZID_80	OVRFL	1		TFR
bearvalley_Macs_	CancelTrialPlan_a	cancel trial planning	172	18:12:52	12:52.5	JGO885	G4	ZID_89	ZID_89	OVRFL	1		TFR
bearvalley_Macs_	UplinkTrialPlan_a	UPLINK CLEARANCE ; ;JGO885ROUTE AMENDED CYYZ./.394121	172	18:12:52	12:52.5	JGO885	G4	ZID_89	ZID_89	OVRFL	1		TFR
bruner_Macs_Cus	CancelTrialPlan_a	cancel trial planning	239	18:13:59	13:59.8	CTN497	B777	ZKC_98	ZKC_98	OVRFL	1		TFR
bruner_Macs_Cus	UplinkTrialPlan_a	UPLINK CLEARANCE ; ;CTN497ROUTE AMENDED IAH./.384957N	239	18:13:59	13:59.8	CTN497	B777	ZKC_98	ZKC_98	OVRFL	1		TFR
bruner_Macs_Cus	CancelTrialPlan_a	cancel trial planning	478	18:17:58	17:58.7	BAG363	B75C	ZID_80	ZID_89	OVRFL	1		TFR
bruner_Macs_Cus	CancelTrialPlan_a	cancel trial planning	488	18:18:08	18:08.6	LDA886	B75C	ZID_80	ZID_89	OVRFL	1		TFR
bruner_Macs_Cus	CancelTrialPlan_a	cancel trial planning	696	18:21:36	21:36.3	MSR310	B75C	ZID_82	ZID_89	ARR	1		TFR
conny_Macs_Cust	UplinkTrialPlan_a	UPLINK CLEARANCE ; ;MSR310ROUTE AMENDED CLT./.390611N	696	18:21:36	21:36.3	MSR310	B75C	ZID_82	ZID_89	ARR	1		TFR
conny_Macs_Cust	CancelTrialPlan_a	cancel trial planning	228	18:13:49	13:49.2	FCA134	B73C	ZKC_14	ZID_82	ARR	1		TFR

Conflict Analysis Tool

- Outputs sequence of DataLink/Conflict/TSAFE events associated with each aircraft within the simulation by Time
- Input:
  - ATC State Events Log File
  - ATC Events Log File
  - TSAFE Events Log File
  - Pilot Events Log File
- Sample Output:

********** Conflict Metrics **********

**** Conflict between AC1: AAL152 <-> AC2: AAL631

**** event	rel time	elapsed time	to aircraft	ac1Owner	ac1GeoSector	ac2Owner	ac2GeoSector	timeToConflict or Initial Loss (secs)	vertical Sep (FT)	lateral Sep (NM)	eventData
ConflictAlert_s	80089	556		ZKC_98	ZID_88	ZKC_98	ZID_88		0	2.009100676	
SeparationViolation_s	80089	556		ZKC_98	ZID_88	ZKC_98	ZID_88		0	1.942949507	
ConflictProbe_s	80090	557		ZKC_98	ZID_88	ZKC_98	ZID_88	9	0	0	
SeparationViolation_s	80090	557		ZKC_98	ZID_88	ZKC_98	ZID_88		0	1.917146712	
DatalinkMsgUplinked_a	80090	557	AAL152	ZKC_98	ZID_88						CLR/FNAAL152
CancelTrialPlan_a	80090	557	AAL152	ZKC_98	ZID_88						cancel trial planning
UplinkTrialPlan_a	80090	557	AAL152	ZKC_98	ZID_88						UPLINK CLEARANCE ;
DatalinkMsgUplinkRecvd_p	80090	557	AAL152		ZKC_98		ZID_88				

**** Summary Metrics	Avg_Vert	Avg_Lat(nm)	Avg_Diag_Sep(nm)	Min_Diag_Sep(nm)	LOS_Duration	Counts_Per_Sector	Counts_Per_AcOwner
SeparationViolation	0	2.9644012	2.9644012	1.5590836	123	ZID_88: 1	ZKC_98: 1
ConflictProbe	0	0.31518987	0.31518987	0		ZID_88: 1	ZKC_98: 1
ConflictAlert	0	6.00337	6.00337	1.5698445		ZID_88: 1	ZKC_98: 1

Custom Log Analysis Tool

- TrialPlan Analysis – Displays trial plan events by time
  - Input: Custom Events Log File
  - Output: Sequence of events sorted by time

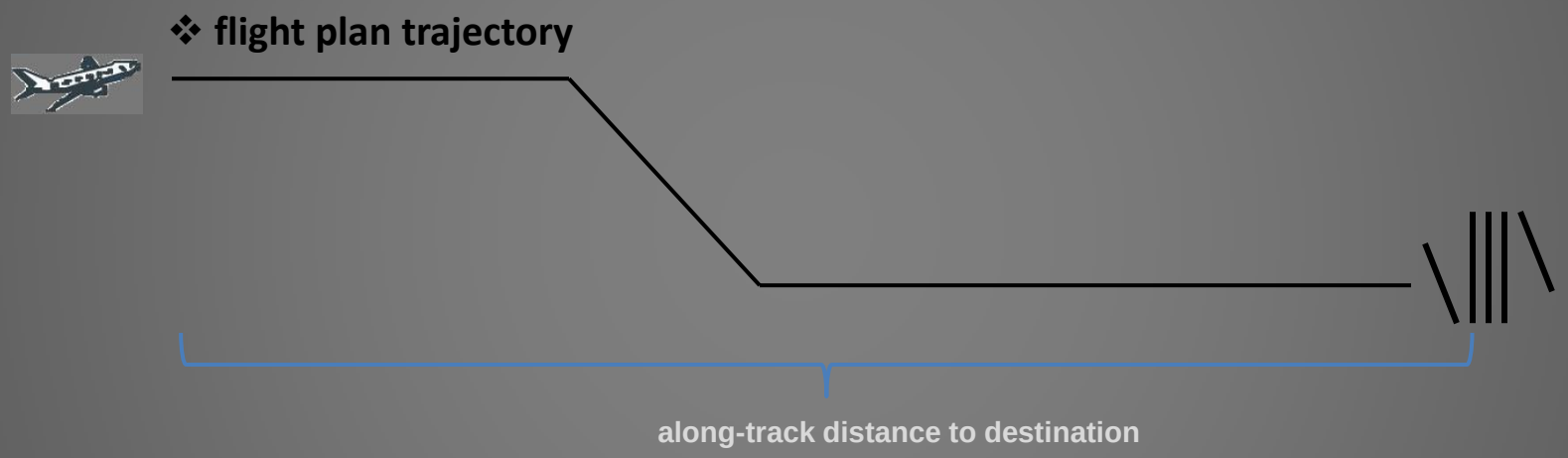
filename	callsign	relTime	time	geo	diffTime	log	event data
bearvalley	MMD090	700	18:21:41	ZKC_98	0	StartTrialPlan_a	start trial plan
bearvalley	MMD090	703	18:21:44	ZKC_98	3	TrialPlanRoute_a	ACCEPT TRIAL PLAN ROUTE SDF MMD090
bearvalley	MMD090	707	18:21:48	ZKC_98	4	TrialPlanInsertPoint_a	inserting point before SDF
bearvalley	MMD090	713	18:21:54	ZKC_98	6	TrialPlanInsertPoint_a	stop dragging
bearvalley	MMD090	718	18:21:59	ZKC_98	5	DatalinkMsgUplinked_a	CLR/FNMMD090,0089/FT ** ROUTE CLEARANCE **
bearvalley	MMD090	718	18:21:59	ZKC_98	0	CancelTrialPlan_a	cancel trial planning
bearvalley	MMD090	718	18:21:59	ZKC_98	0	UplinkTrialPlan_a	UPLINK CLEARANCE ; ;MMD090ROUTE AMENDED: L
DIFF	MMD090				18	StartTrialPlan_DatalinkMsgUplinked	

- ETA/STA Analysis – Displays ETA/STA time Differences at Sector Crossing events
  - Input: Custom Events Log File, TimeLine Log File
  - Output: ETA/STA time difference

TimeLineLog	CustomLog	eventTime	timeline	sta	eta	sta - eta	sta/eta frozen	event	eventData	relEventTime	eventTime	callSign
menorca_Mac	bearvalley_Ma	18:17:58	BNA	18:53:21	18:52:18	63	TRUE	SectorBoundaryCrossed	left sector ZKC_30, crossed into ZKC_28	477	18:17:58	AUB051
menorca_Mac	bearvalley_Ma	18:19:23	BNA	18:53:21	18:52:18	63	FALSE	SectorBoundaryCrossed	left sector ZKC_28, crossed into ZKC_29	562	18:19:23	AUB051
menorca_Mac	bearvalley_Ma	18:21:32	BRDON	18:57:00	18:57:52	-52	TRUE	SectorBoundaryCrossed	left sector ZAU_44, crossed into ZKC_92	691	18:21:32	CCA727
menorca_Mac	bearvalley_Ma	18:24:32	BRDON	18:57:00	18:58:23	-83	TRUE	SectorBoundaryCrossed	left sector ZKC_92, crossed into ZKC	871	18:24:32	CCA727
menorca_Mac	bearvalley_Ma	18:24:35	BRDON	18:57:00	18:58:23	-83	TRUE	SectorBoundaryCrossed	left sector ZKC, crossed into ZAU_44	874	18:24:35	CCA727
menorca_Mac	bearvalley_Ma	18:15:08	RUGBB	19:04:00	19:04:06	-6	TRUE	SectorBoundaryCrossed	left sector ZID_80, crossed into ZKC_98	307	18:15:08	NWA761
menorca_Mac	bearvalley_Ma	18:18:50	RUGBB	19:04:00	19:04:06	-6	TRUE	SectorBoundaryCrossed	left sector ZKC_98, crossed into ZAU_44	529	18:18:50	NWA761
menorca_Mac	bearvalley_Ma	18:23:59	RUGBB	19:04:00	19:04:06	-6	TRUE	SectorBoundaryCrossed	left sector ZAU_44, crossed into ZKC_94	838	18:23:59	NWA761
menorca_Mac	bearvalley_Ma	18:12:25	TYGER	18:55:00	18:55:21	-21	TRUE	SectorBoundaryCrossed	left sector ZID_80, crossed into ZKC_98	144	18:12:25	SWA112
menorca_Mac	bearvalley_Ma	18:18:45	TYGER	18:55:00	18:55:01	-1	TRUE	SectorBoundaryCrossed	left sector ZKC_98, crossed into ZKC_94	524	18:18:45	SWA112

Route Analysis Tool – sim start

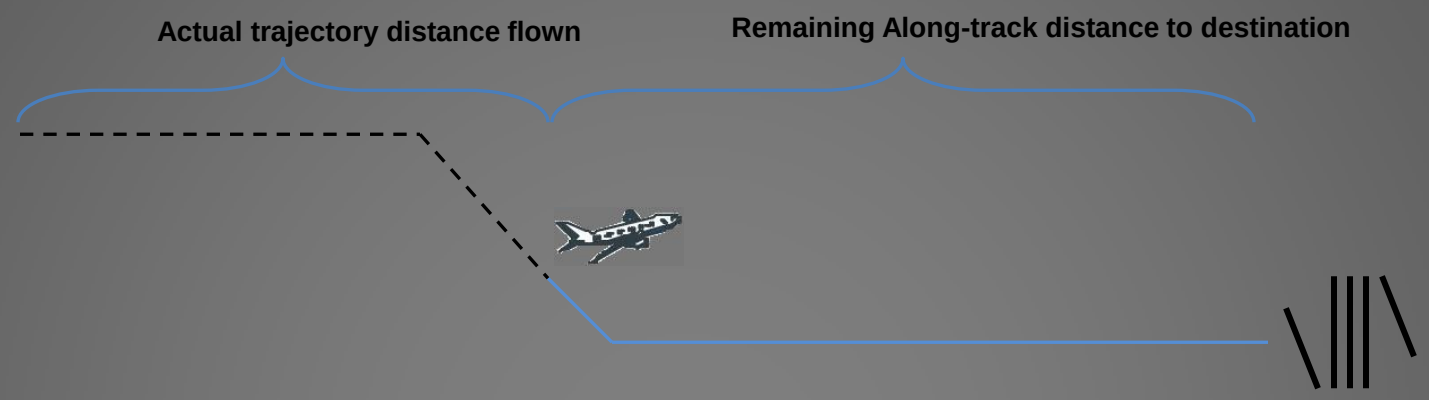
- Outputs path & time differences between predicted trajectory and actual flight path
- Background:



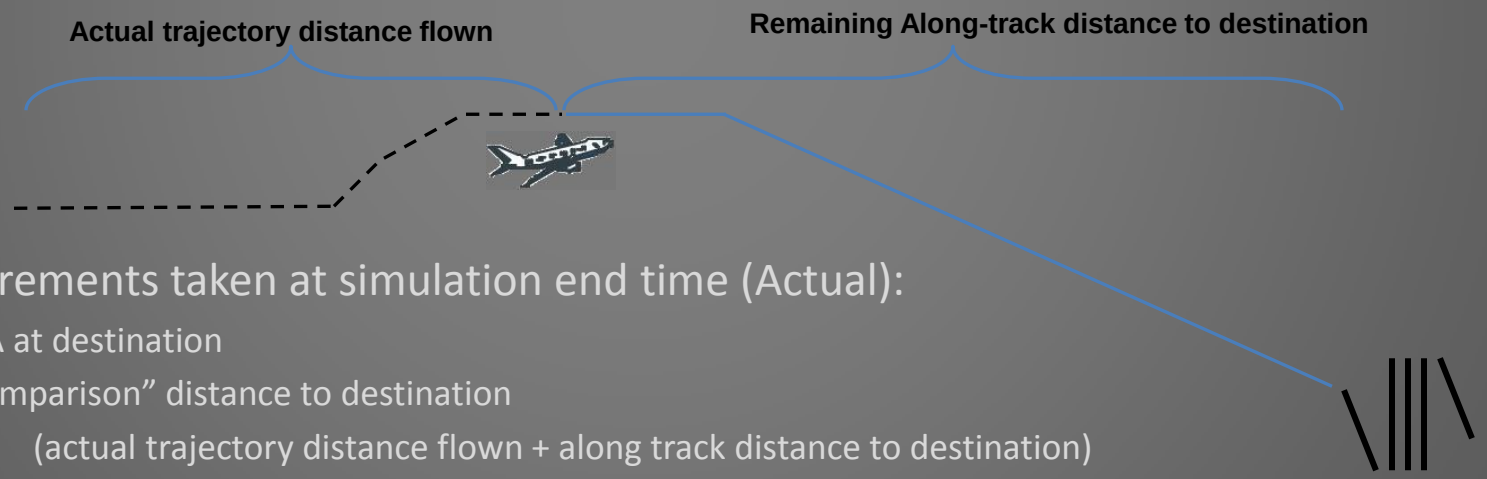
- Measurements taken at simulation start time (Planned):
  - ETA at destination
  - along-track distance to destination

Route Analysis Tool - sim end

❖ **if no trajectory modifications occur**



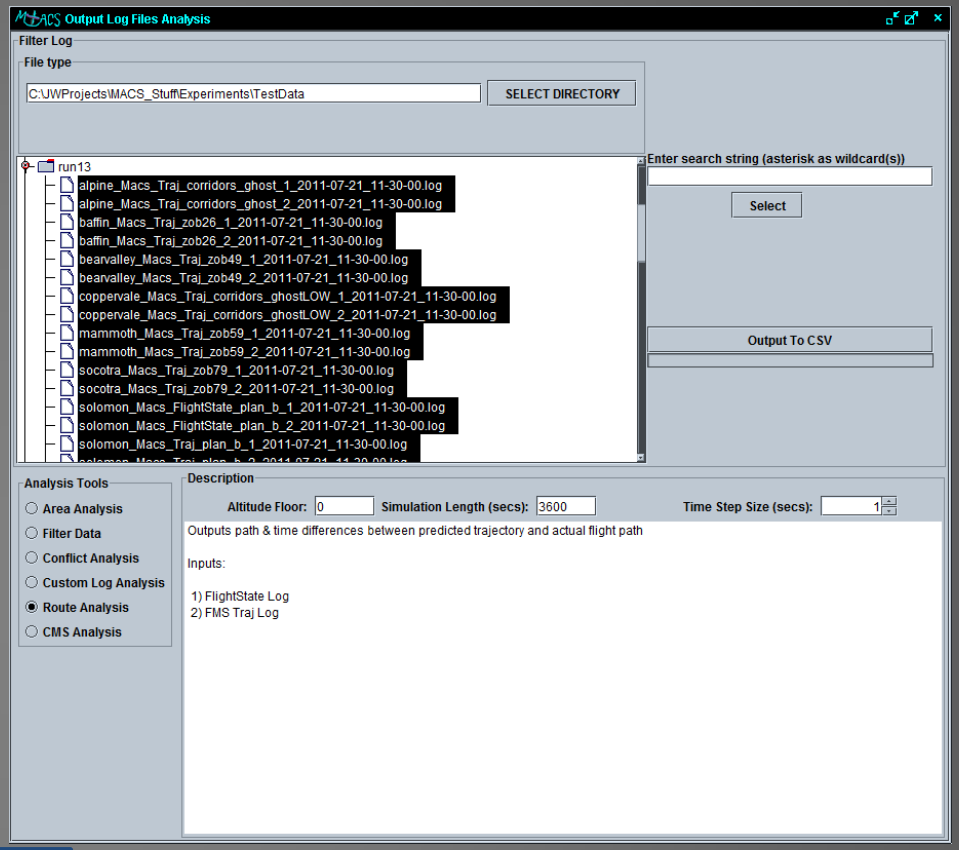
❖ **if trajectory modifications occur**



- Measurements taken at simulation end time (Actual):
  - ETA at destination
  - "comparison" distance to destination
    - (actual trajectory distance flown + along track distance to destination)
- Analysis:
  - Planned ETA vs. Actual ETA
  - Planned along track distance to destination vs. Actual along track distance to destination

Route Analysis Tool

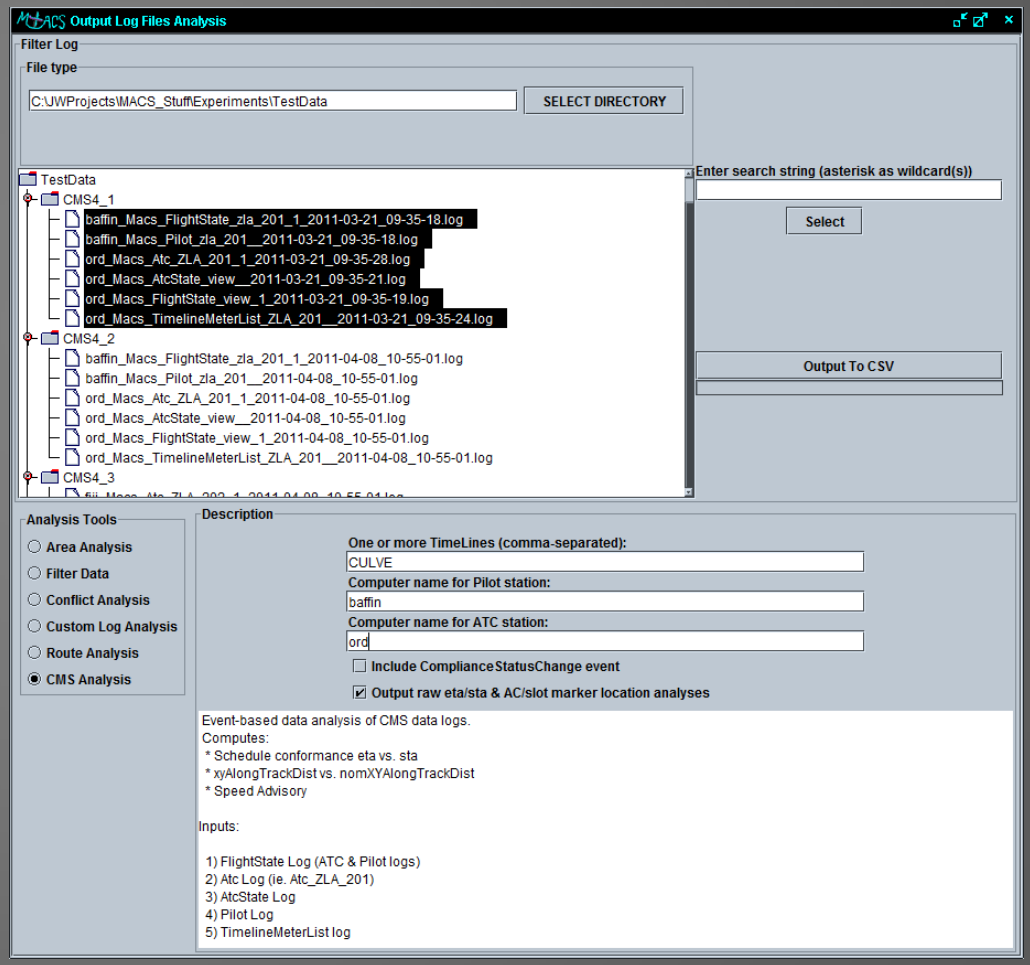
- Input:
  - FlightState Log File
  - FMS Traj Log File
- Output:
  - Path Difference
  - Time Difference



callsign	flightRules	predFmsTraj AlongTrackToDest	predFmsTraj EtaToDest	actualDistFlown	etaToDest FromTrajPt	inLnavSeconds	outLnavSeconds	pathDiff	etaDiff
SWA1450	IFR	390.2698817	21:37:50	382.3231506	21:32:19	2767	13	-7.94673	-330
AAL1063	IFR	365.1180038	21:45:09	357.2070618	21:41:36	3308	12	-7.91094	-212
ACA985	TFR	344.1252632	21:37:00	336.2247314	21:34:23	2862	12	-7.90053	-156
DAL249	TFR	367.1191754	21:41:28	359.2406921	21:37:52	3104	12	-7.87848	-215
WJA1245	TFR	429.9324036	21:45:56	422.0585022	21:43:31	3408	13	-7.8739	-144
N975RR	IFR	206.6821289	21:19:10	198.8411102	21:14:40	1702	12	-7.84102	-270
N414TR	TFR	397.6640835	21:36:07	389.8297729	21:30:22	2652	12	-7.83431	-344
FIV699	TFR	394.8401489	21:35:48	387.026062	21:30:34	2664	12	-7.81409	-313
NAC756	IFR	348.0309067	21:42:35	340.2409973	21:38:40	3134	12	-7.78991	-234
TCF7615	TFR	346.6830554	21:31:18	338.9114685	21:28:28	2519	13	-7.77159	-170

CMS Analysis Tool

- Event-based data analysis of CMS data logs
  - Schedule conformance of STA vs. ETA
  - xyAlongTrackDist vs. nominal XYAlongTrackDist
  - Speed Advisory Data



CMS Analysis Tool

- Input:
  - FlightState log File(Pilot and ATC stations)
  - ATC Log File
  - AtcState Log File
  - TimelineMeterList Log File
- Output:
  - At the time of any controller or pilot action – event based output
    - STA / ETA time difference in seconds
    - displayed speed advisory
    - alongTrackDistToDestination vs. nominal AlongTrackDistanceToDestination

callsign	eventTime	speedAdvisory	timeline	sta arrivalTime	eta arrivalTime	sta - eta	xyAlongTrackDist	nomXYAlongTrackDist	nomXYAlongTrackDist - xyAlongTrackDist	event	event data
ASA848	17:09:52	250 CULVE	CULVE	17:21:22	17:21:15	7	88.04712	89.04936	1.002243	AcHandedOff_a	hand off to sector: ZLA_201
ASA848	17:09:52	250 CULVE	CULVE	17:21:22	17:21:15	7	88.04712	89.04936	1.002243	AcceptHandoff_a	HANDOFF ACCEPTED ASA848
ASA848	17:15:17	210 CULVE	CULVE	17:21:22	17:20:44	38	51.45197	55.25799	3.8060226	SectorBoundaryCrossed_a	left sector ZLA_13, crossed into ZLA_201
ASA848	17:20:36	L 0:04	CULVE	17:20:48	17:20:52	-4	28.41309	28.21082	-0.20227051	SectorBoundaryCrossed_a	left sector ZLA_201, crossed into ZLA
ASA848	17:10:14	250 CULVE	CULVE	17:20:52	17:21:13	-21	85.21399	82.90646	-2.3075256	SelectAc_p	Aircraft Selected: selected = ASA848
ASA848	17:12:12	240 CULVE	CULVE	17:21:22	17:20:54	28	70.767975	73.16579	2.397812	McpSpeedVnavOn_p	target speed: 270
ASA848	17:13:47	210 CULVE	CULVE	17:21:22	17:20:39	43	60.160393	63.782345	3.621952	SelectAc_p	Aircraft Selected: selected = ASA848
ASA848	17:18:43	210 CULVE	CULVE	17:21:22	17:20:44	38	34.697266	37.235783	2.538517	SelectAc_p	Aircraft Selected: selected = ASA848
ASA848	17:18:47	E 0:02	CULVE	17:20:48	17:20:45	3	34.405766	35.998726	1.5929604	ShippedAc_p	122.1

Questions?

- Data Collection Setup panel
- Types of Logs
- Location of MACS Data
- Other Influencing Factors
- Real-Time Analysis Tools
- Post-Processing Analysis Tools

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