



CENTER FOR ADVANCED AVIATION SYSTEM DEVELOPMENT (CAASD)

Test Scenarios for ASSAP MOPS: Intersource Correlation

Moody, Giovino, Eftekari



Background

- **Draft MOPS states requirements for Intersource Correlation are expressed as follows:**
 - **The inter-source correlation algorithm shall perform at least as well as the example algorithm given in Appendix TBD with respect to distinguishing unique tracks and miscorrelating tracks between ADS-B, ADS-R, and TIS-B sources. This intent is met by passing the correlation test scenarios given in section 2.**
- **Requirements for correlating TIS-B with ownship and TCAS with ADS-B/ADS-R/TIS-B are similarly stated**
- **Thus relying heavily on the scenarios to, in effect, establish the requirement**
- **MITRE had action to propose scenarios for this testing**



Proposed Scenarios to Test Correlation

- **Use 2 trajectory sets**
 - a simple 2 aircraft trajectory with high dynamics
 - a complex multi-aircraft trajectory based on actual high density approach operations

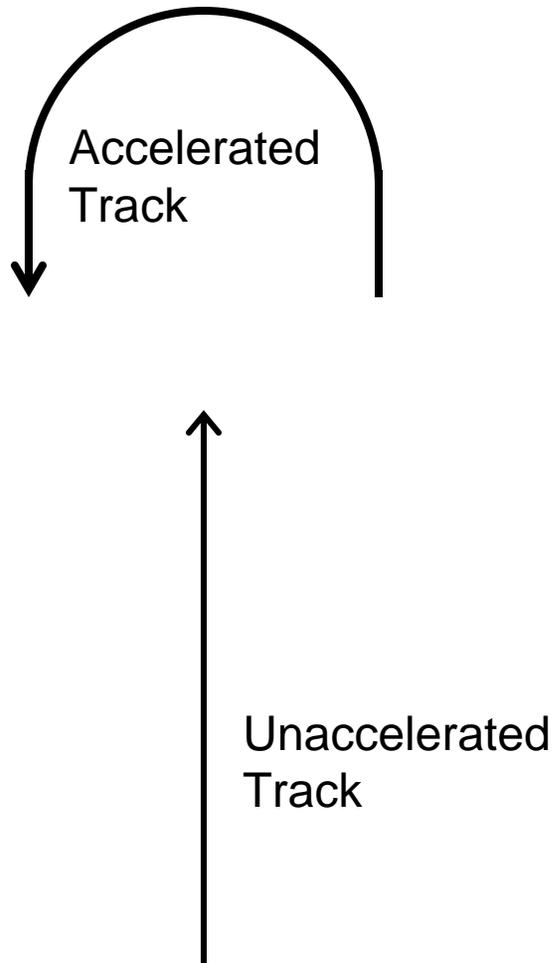


Scenario Generation Process

- **For each trajectory set (dual and multi aircraft case):**
 - **Generate idealized truth with continuous velocity and acceleration sampled at 5 hz on 200 ms epoch**
 - **Identify specific scenarios that result by assigning source type(s) applicable to each truth track**
 - **Apply degradations appropriate to the identified source**
 - **position noise appropriate for the source**
 - **decimate samples based on link tx protocol and loss due to interference and fading**



Two Aircraft Trajectory Set



- **Accelerated Track**: 180 deg turn at 6 deg/sec @ 200 kts with 15 seconds wings level before and after turn
- **Unaccelerated Track**: Level approaching the accelerated track at 200 kts
- ~ 1 min duration per scenario



Scenarios Derived from Two Aircraft Trajectory Set

Scenario #	Ownship Track	Ownship TIS-B	Target Track	Target Sources				Note
				ADS-B	ADS-R	TIS-B	TCAS	
1	Unaccel	N	Accel	Y	N	N	Y	For installations that support TCAS
2	Unaccel	N	Accel	N	Y	N	Y	
3	Accel	Y	Unaccel	N	N	N	N	
4	Unaccel	N	Accel	Y	N	N	N	For installations that do not support TCAS
5	Unaccel	N	Accel	N	Y	N	N	
6	Accl	Y	Unaccel	N	N	N	N	

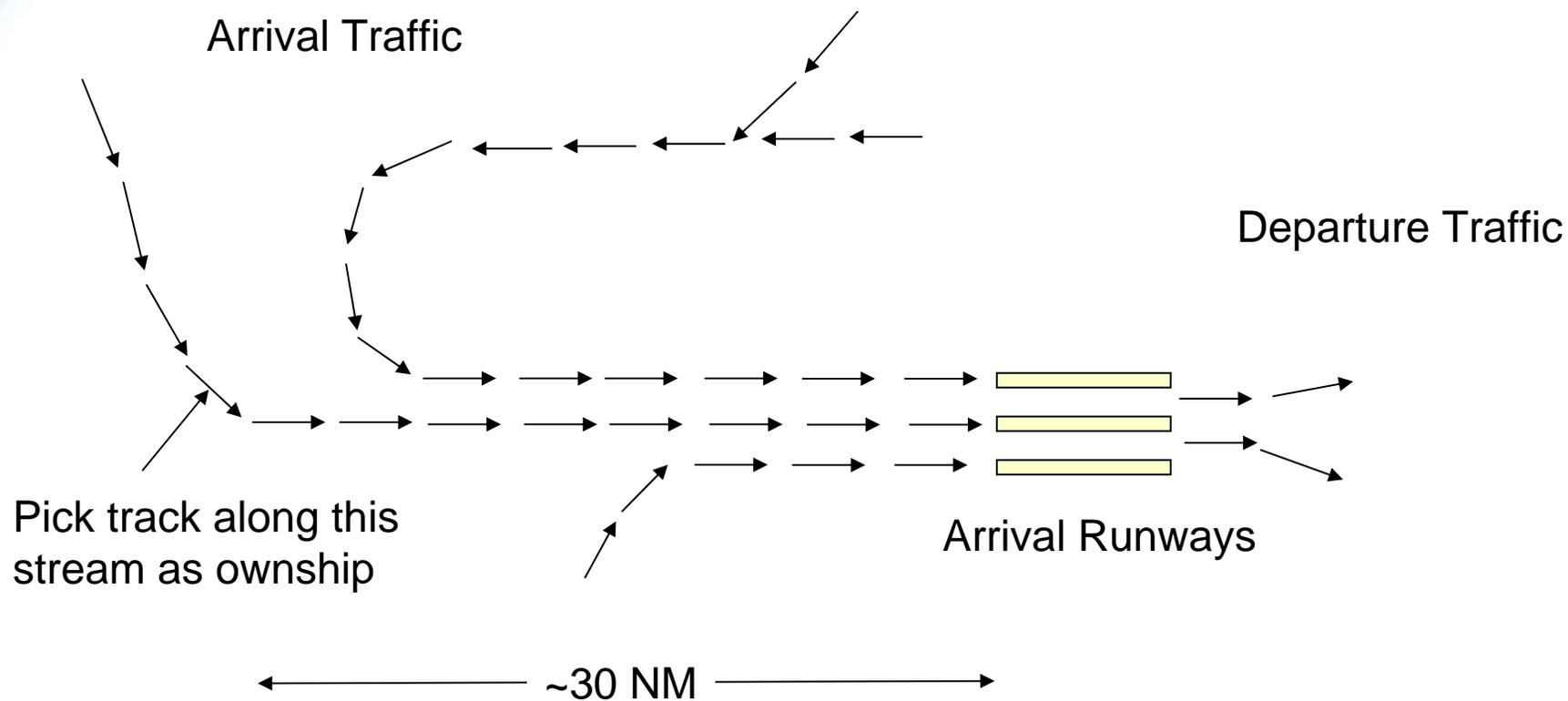


Multi-Aircraft Trajectory Set

- **Base on recorded data obtained for ATL**
 - **triple parallel approaches in use (8L, 9R, 10)**
 - **use all data seen by ATL terminal radar (~60 NM radius)**
 - **approximately 12 minute duration (time for ownship approach) with ~120 total unique tracks**
 - **select target being sequenced for center parallel as ownship**
 - **busy arrival time (4:30 pm local Aug 2006)**

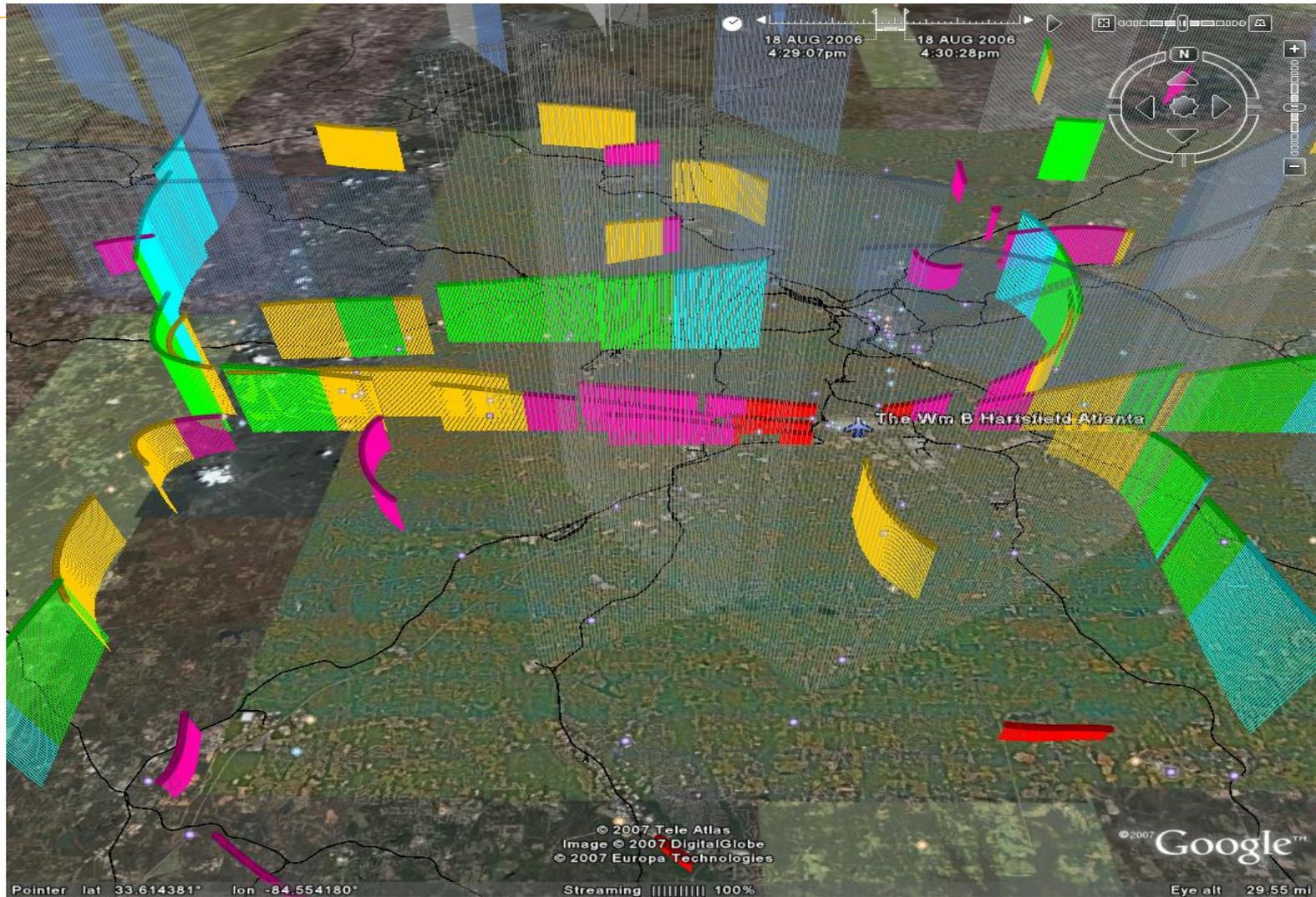


ATL: Nominal Arrival Flow of Recorded Data





Snapshot of ATL Arrivals





Scenarios Derived from Multi-Aircraft Trajectory Set

Scenario #	Ownship Track #	Ownship TIS-B	Target Track #s	Target Sources				Note
				ADS-B	ADS-R	TIS-B	TCAS	
1	T _a	Y	T _b – T _c (~75%)	Y	N	N	Y	For installations that support TCAS
			T _d - T _e (~20%)	N	Y	N	Y	
			T _f – T _g (~5%)	Y	N	Y	Y	
2	T _a	Y	T _b – T _c (~75%)	Y	N	N	N	For installations that do not support TCAS
			T _d - T _e (~20%)	N	Y	N	N	
			T _f – T _g (~5%)	Y	N	Y	N	