

One sky for Europe



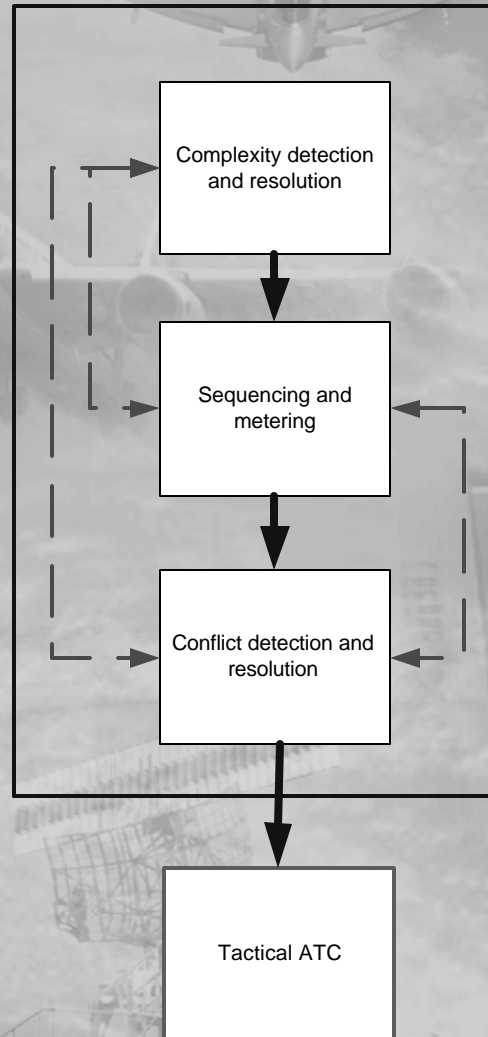
CORA - level 2

**Resolution calculation and
ranking on Quality Index**

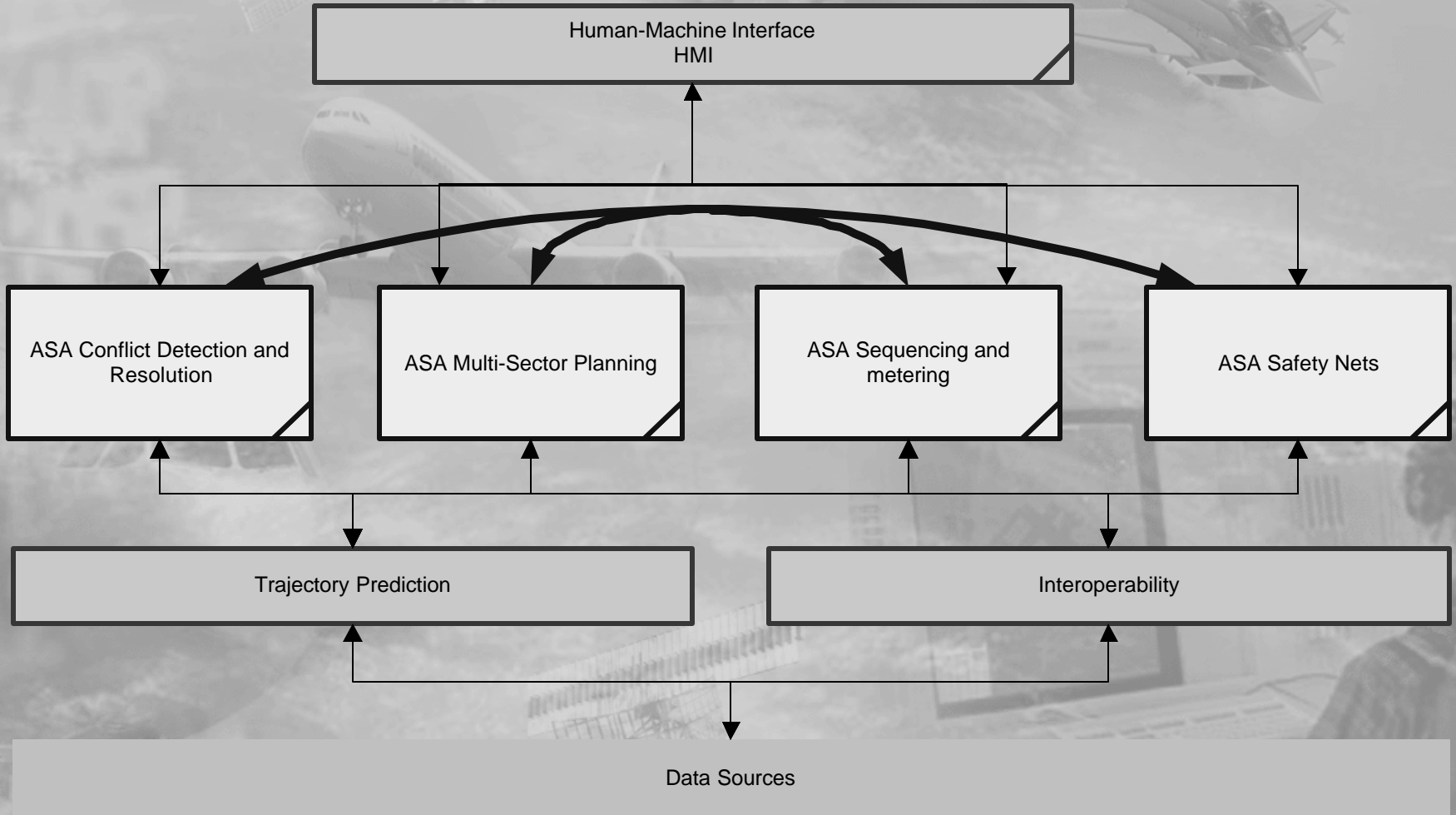
NEXTOR - 2-3. June.2003

Mary Flynn, Seppo Kauppinen

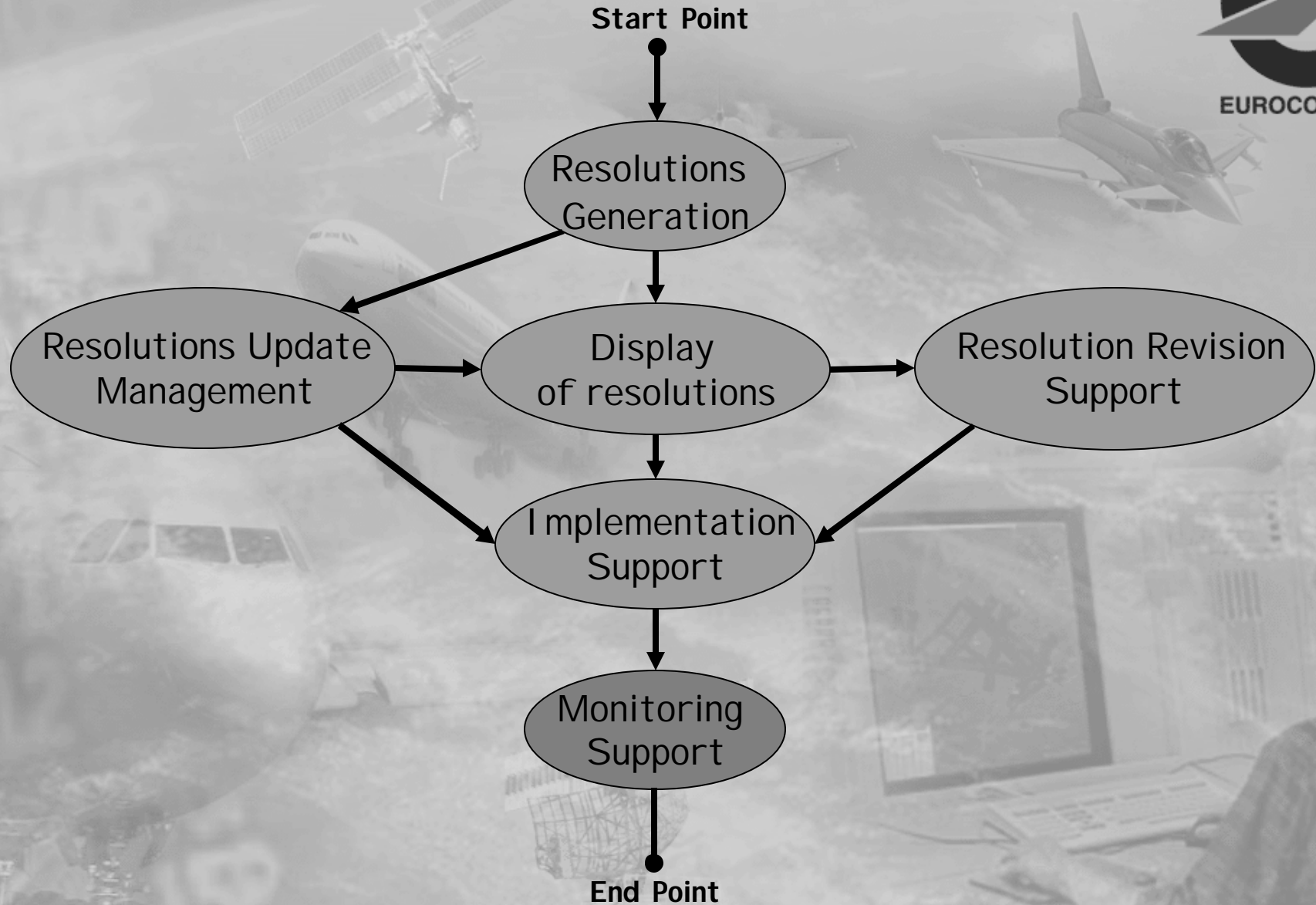
ATC Layered Planning



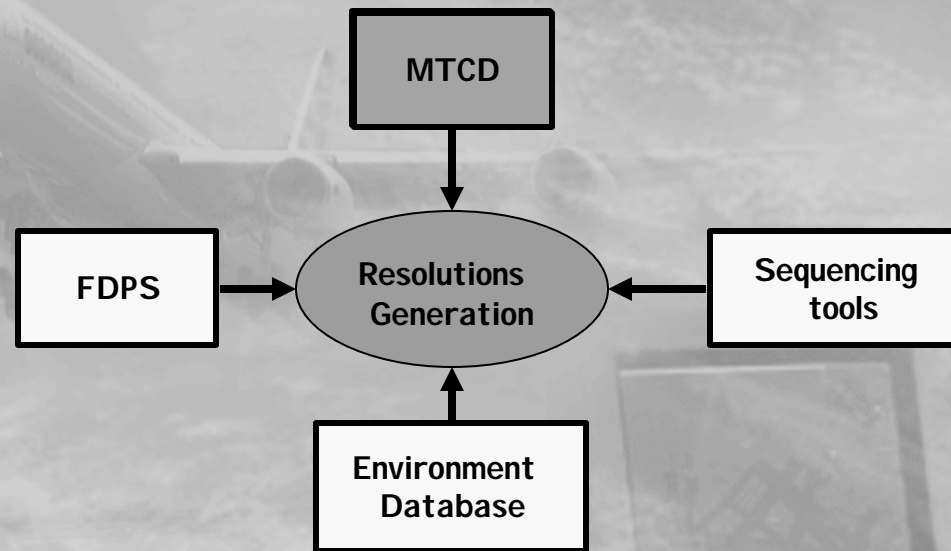
ASA Context



CORA Resolver



Resolution Generation Context



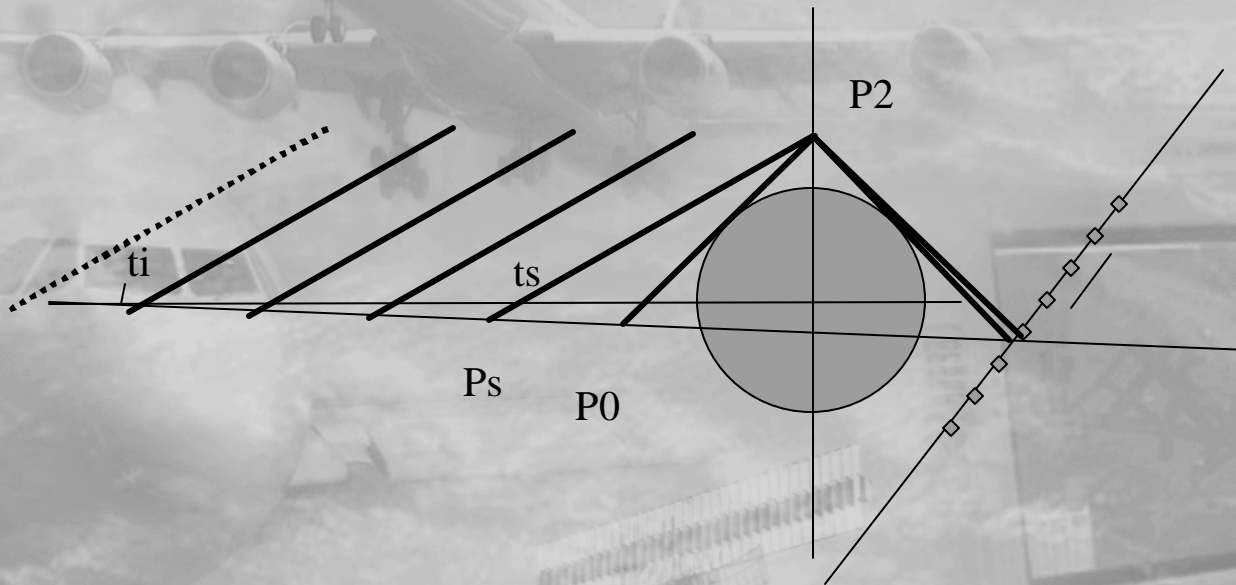
Resolution domains

- Lateral
 - left/right heading change
 - direct to a future known way-point
- Vertical
 - up or down
- Speed
 - faster or slower

Resolution construction

- For each Domain
 - find a minimum flyable solution
 - minimum solution defines the resolution space
 - any flyable trajectory in resolution space is considered a resolution
 - a set of resolutions is constructed
 - all resolutions must return somewhere on the original trajectory

Resolution construction



Resolution ranking

- The best resolution shown automatically for each sense; heading, speed or level change
- Ranking is based on Quality Index calculated for each generated resolution

Potential Quality Indicators

Number of conflicts resolved

Degree of deviation from the original flight route

Co-ordination load

Controller workload

Conflict-free horizon

Sequencing constraints

Airspace rules

Monitoring

Minimum manoeuvre

Airline preferences

Pilot workload

Equipment and aircraft capability

Quality Indicators considered




- Trajectory length
- Trajectory profile
- Trajectory deviation
- Time difference
- Time and Distance to first loss of separation
- Time and Distance to closest point of approach
- Co-ordination required
- Number of ATCO clearances
- Number of conflicts solved

Resolution list window

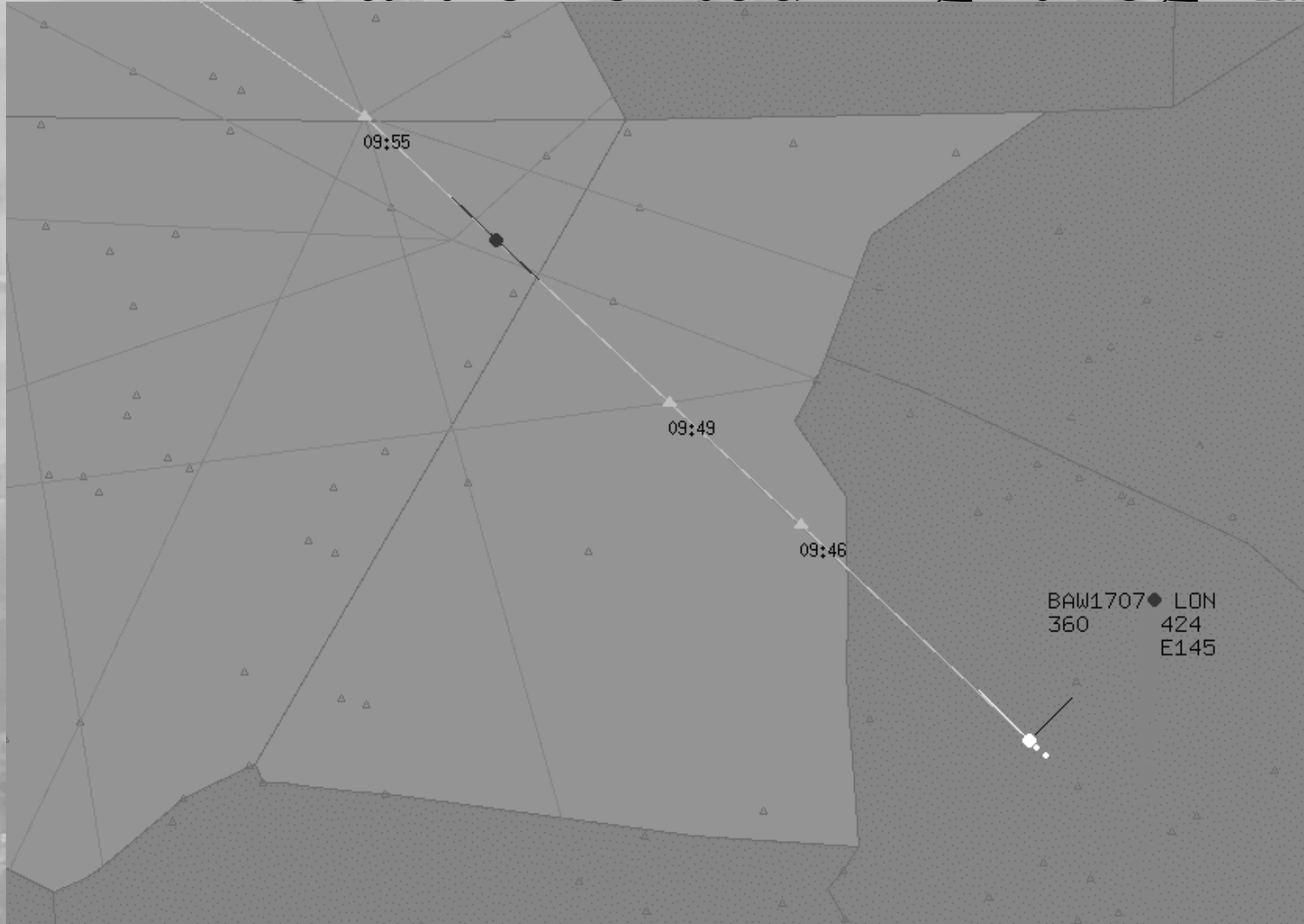
Resolution List: DAL49 - TYR481X

DAL49	TYR481X	no co	DCT	SPD	↑	↓	←	→	close
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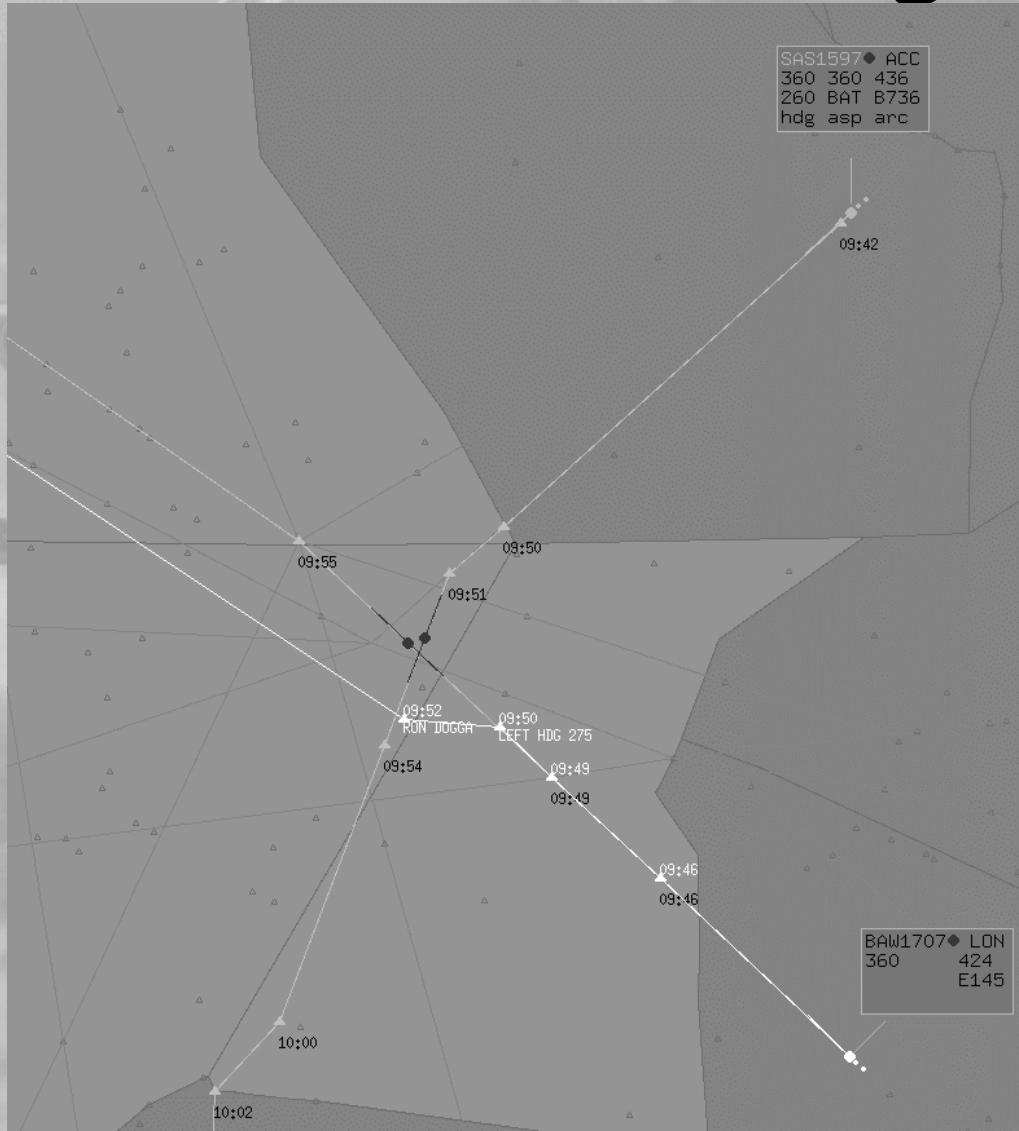
no resolution

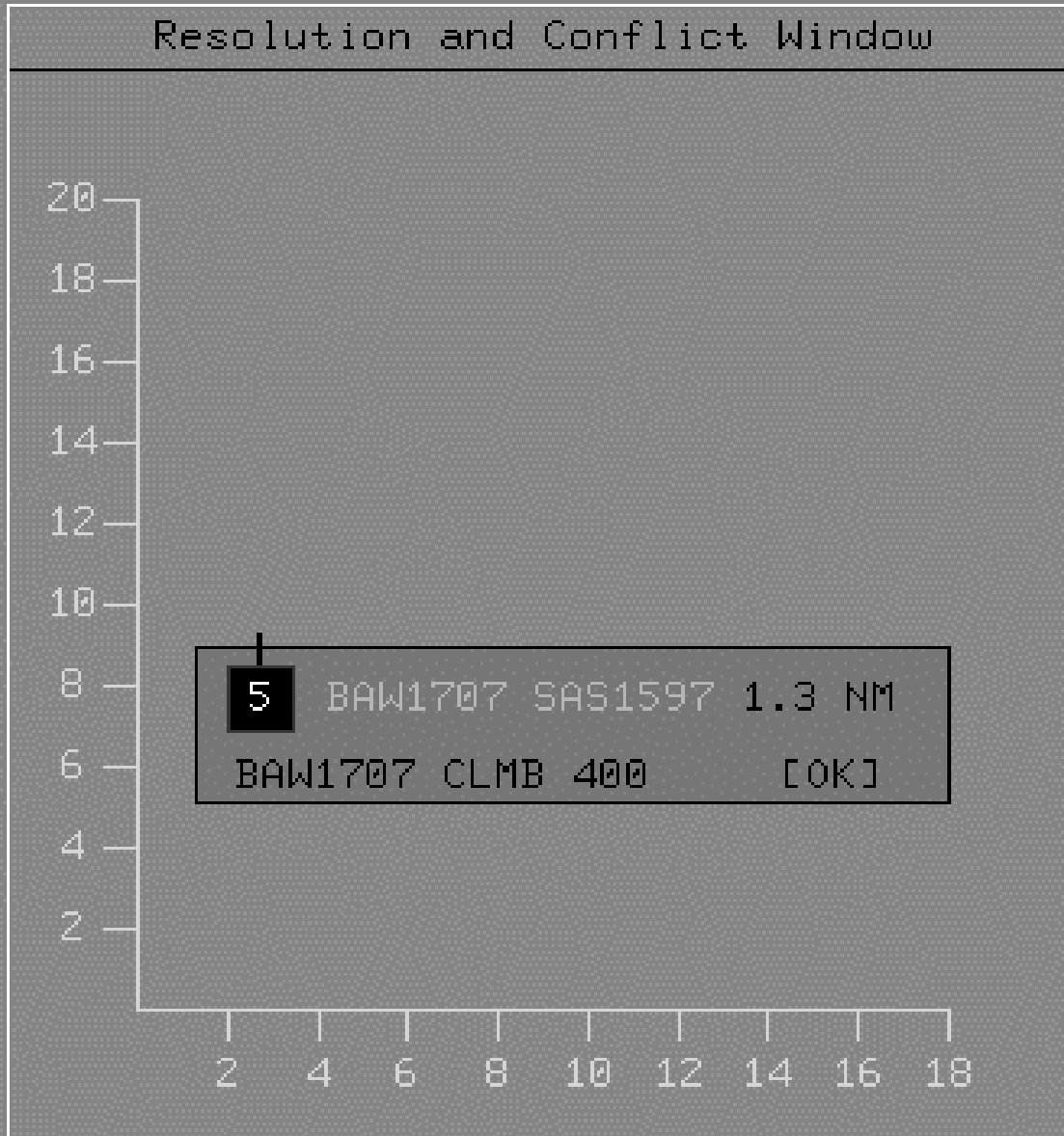
RIGHT H300, RON DOGGA	TYR481X	[02:43]	(23, 28)		[OK]
DIR DOGGA	TYR481X	[02:15]	(22, 28)		[OK]
DESC 320	TYR481X	[02:15]	(05, 88)		[OK]
CLMB 360	DAL49	[08:38]	(01, 100)		[OK]
DECR MO.64	DAL49	[03:40]	(10, 80)		[OK]

Aircraft oriented flight leg



Problem oriented flight leg





The End

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End notes

- Ranking will optimise used resolutions
- Ranking adds value to ATCO own resolutions
- Further work needed to optimise values
- Full simulation in 2004