**4 March 2002**
**UAT-WP-11-18**

**RTCA Special Committee 186, Working Group 5**
**ADS-B UAT MOPS**
**Meeting #11**

# UAT Receiver Loading Analysis

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SUMMARY

The Multi-Aircraft UAT Simulator (MAUS) was run for various scenarios and the number of messages received are analyzed in order to facilitate receiver design.

# Aircraft in Sight Analysis

- Filter ranges for ‘Looker’:
  - A3 – 150 NM
  - A2 – 60 NM
  - A1 – 30 NM
  - A0 – 15 NM
  - A3* - 180 NM
  - B2 – 20 NM
- “Within filter range” means that the equipage type of the ‘looker’ aircraft will count all aircraft up to the filter range
- “Symmetric filter range” means the number of aircraft counted depends on the looking range as above *and also* the ‘seen’ aircraft equipage’s filter range
  - e.g. A2 ‘looking’ will count all A3 and A2 out to 60 NM, A1 aircraft out to 30 NM, A0 out to 15 NM, and B2 to 20 NM

# Aircraft in Sight by Equipage

**LA**

| Receiver | | A3 | A2 | A1 | A0 | A3* |
|---|---|---|---|---|---|---|
| Within filter range | Max | 1151 | 614 | 418 | 262 | 1296 |
| | Mean | 382 | 125 | 43 | 17 | 440 |
| symmetric filter range | Max | 632 | 469 | 389 | 262 | 671 |
| | Mean | 149 | 73 | 38 | 17 | 167 |

**CE**

| Receiver | | A3 | A2 | A1 | A0 | A3* |
|---|---|---|---|---|---|---|
| Within filter range | Max | 1104 | 347 | 219 | 172 | 1420 |
| | Mean | 564 | 139 | 53 | 38 | 746 |
| symmetric filter range | Max | 514 | 295 | 217 | 172 | 625 |
| | Mean | 228 | 102 | 51 | 38 | 281 |

# Assumptions for Message Loading Analysis

- MAUS runs to collect data
  - All receiver types
  - LA and Core Europe Scenarios
- Interference
  - No Link 16, DME, and most co-site
  - On-board DME and UAT self-interference
- Worst Case of Message Receptions – All messages with greater than 10% message success rate, were counted as *received*
- Long message = 384 bits
- Short message = 240 bits

# Maximum Information per Second

| Receiver | | A3 Hi | A3 15 | A2 Hi | A2 15 | A1 Hi | A1 15 | A0 |
|---|---|---|---|---|---|---|---|---|
| LA | Long | 418 | 401 | 429 | 413 | 368 | 356 | 352 |
| | Short | 203 | 241 | 194 | 221 | 134 | 189 | 204 |
| | | | | | | | | |
| | kbps | 205 | 205 | 209 | 205 | 170 | 176 | 181 |
| CE | Long | 492 | 502 | 510 | 529 | 436 | 443 | 425 |
| | Short | 115 | 166 | 103 | 157 | 76 | 123 | 149 |
| | | | | | | | | |
| | kbps | 212 | 225 | 215 | 231 | 179 | 195 | 193 |

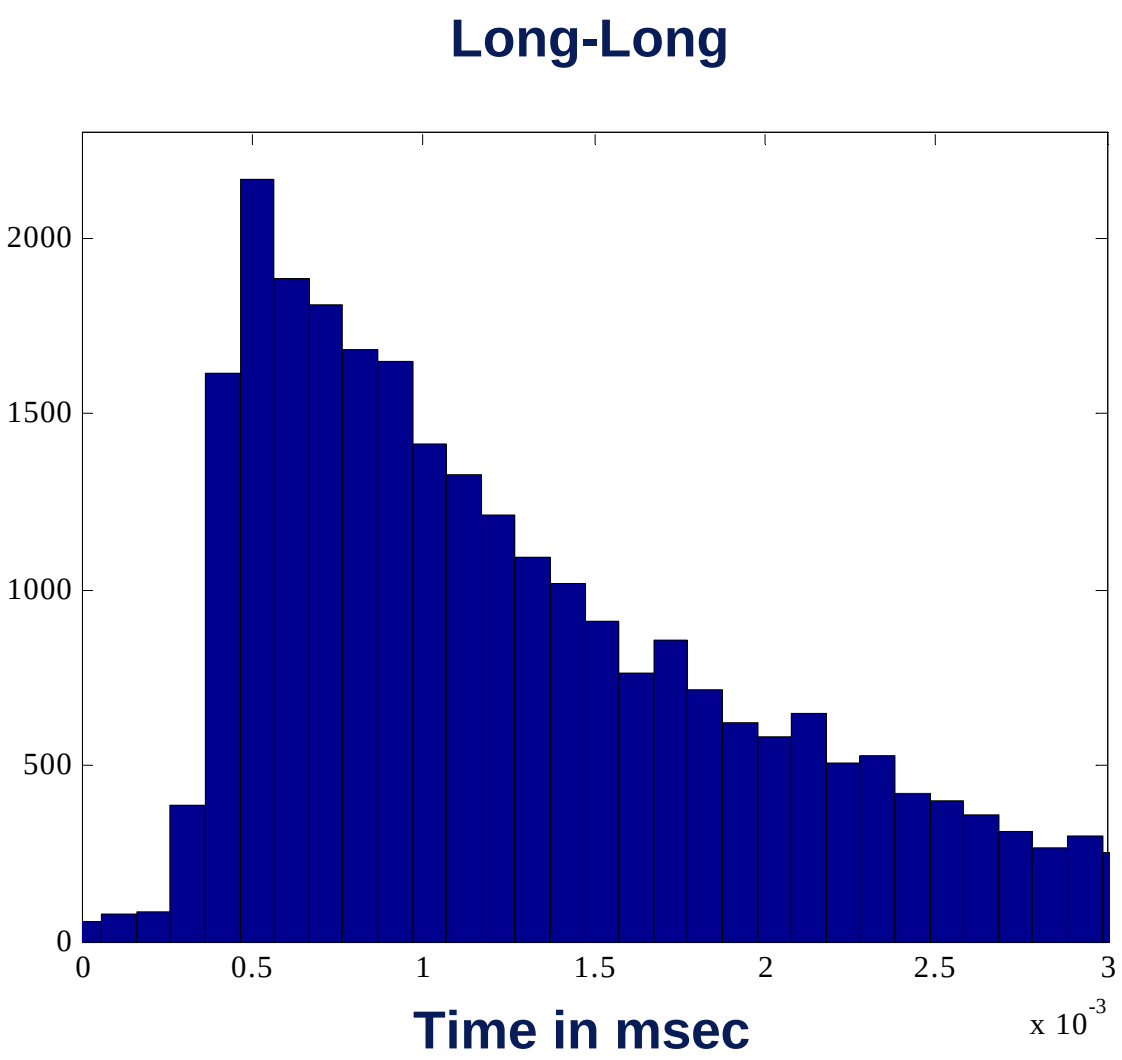
# Peak Information

- Used a 100 msec sliding window through 100 second simulation run
- Found peak bits for all messages received with MSR > 0.1
- Found peak number of total messages (Long + Short) received with MSR > 0.1
- Instants where peak bits and peak messages occur are not necessarily the same

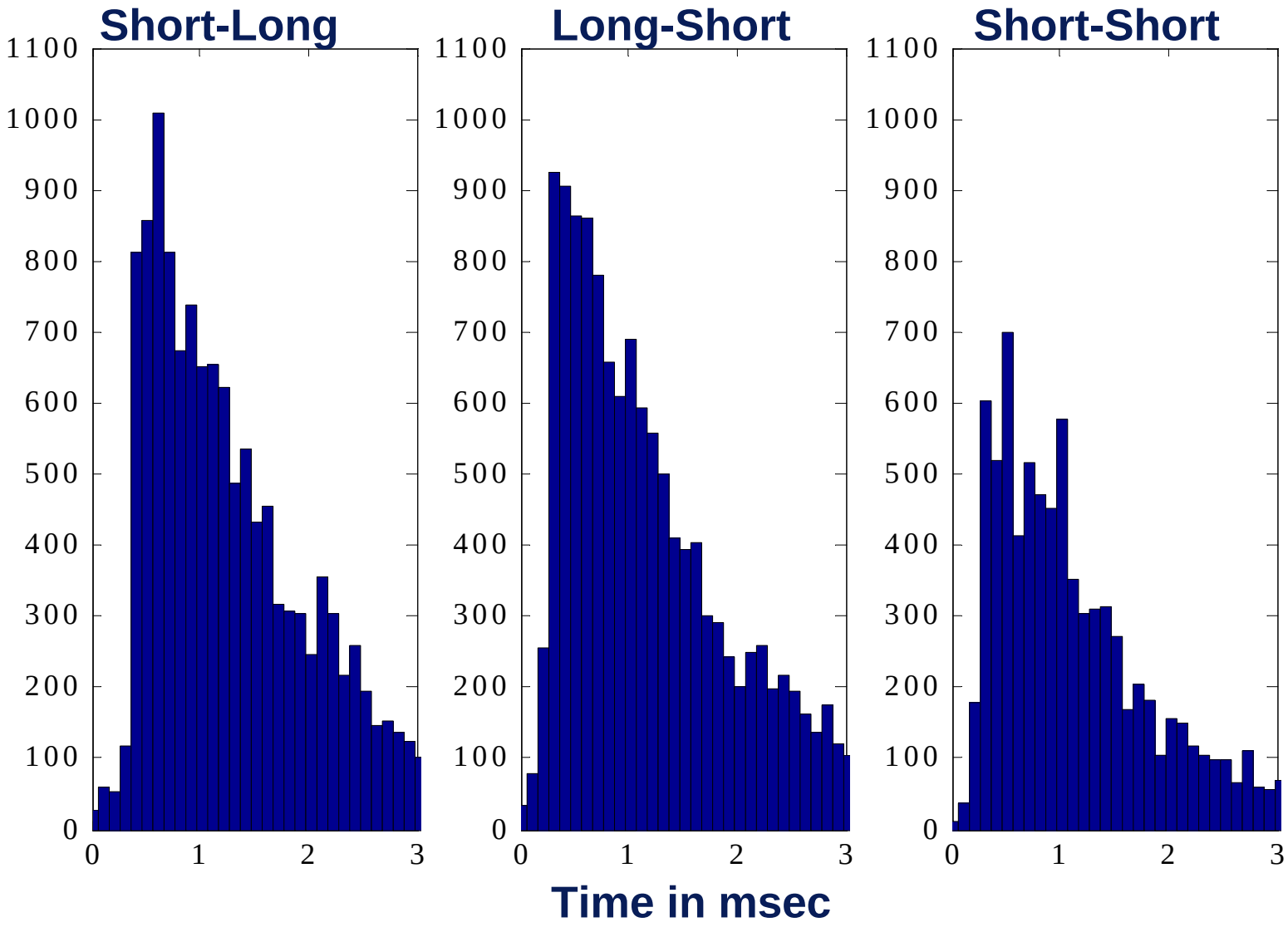
# Peak Information Transfer

| Receiver | | A3 Hi | A3 15 | A2 Hi | A2 15 | A1 Hi | A1 15 | A0 |
|---|---|---|---|---|---|---|---|---|
| LA | Long | 60 | 61 | 66 | 69 | 56 | 57 | 61 |
| | Short | 36 | 37 | 32 | 29 | 23 | 28 | 26 |
| | | | | | | | | |
| | kbps | 331 | 332 | 343 | 336 | 276 | 288 | 297 |
| CE | Long | 77 | 74 | 80 | 81 | 71 | 62 | 59 |
| | Short | 18 | 25 | 16 | 25 | 8 | 24 | 27 |
| | | | | | | | | |
| | kbps | 344 | 344 | 346 | 346 | 292 | 306 | 306 |

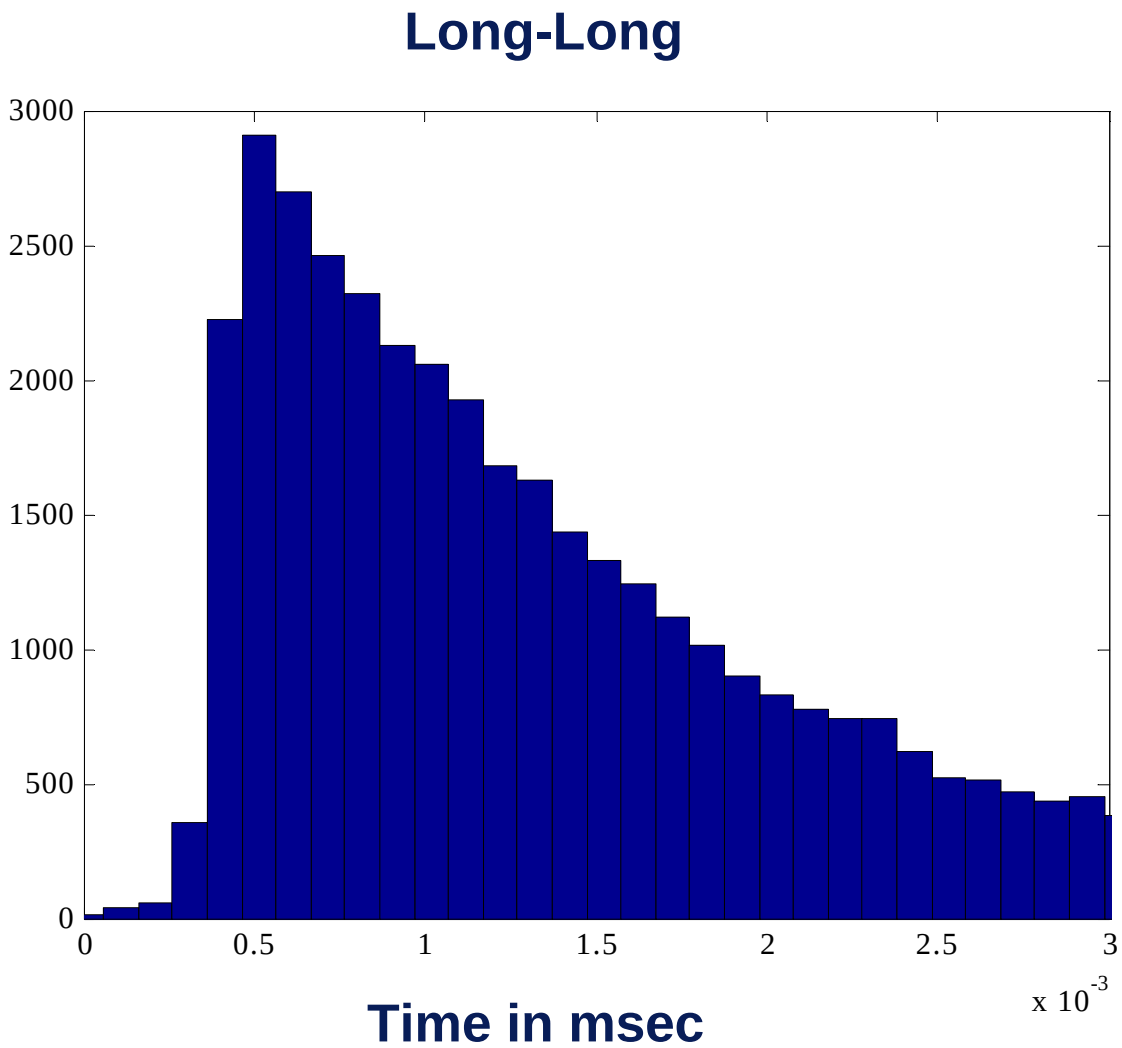
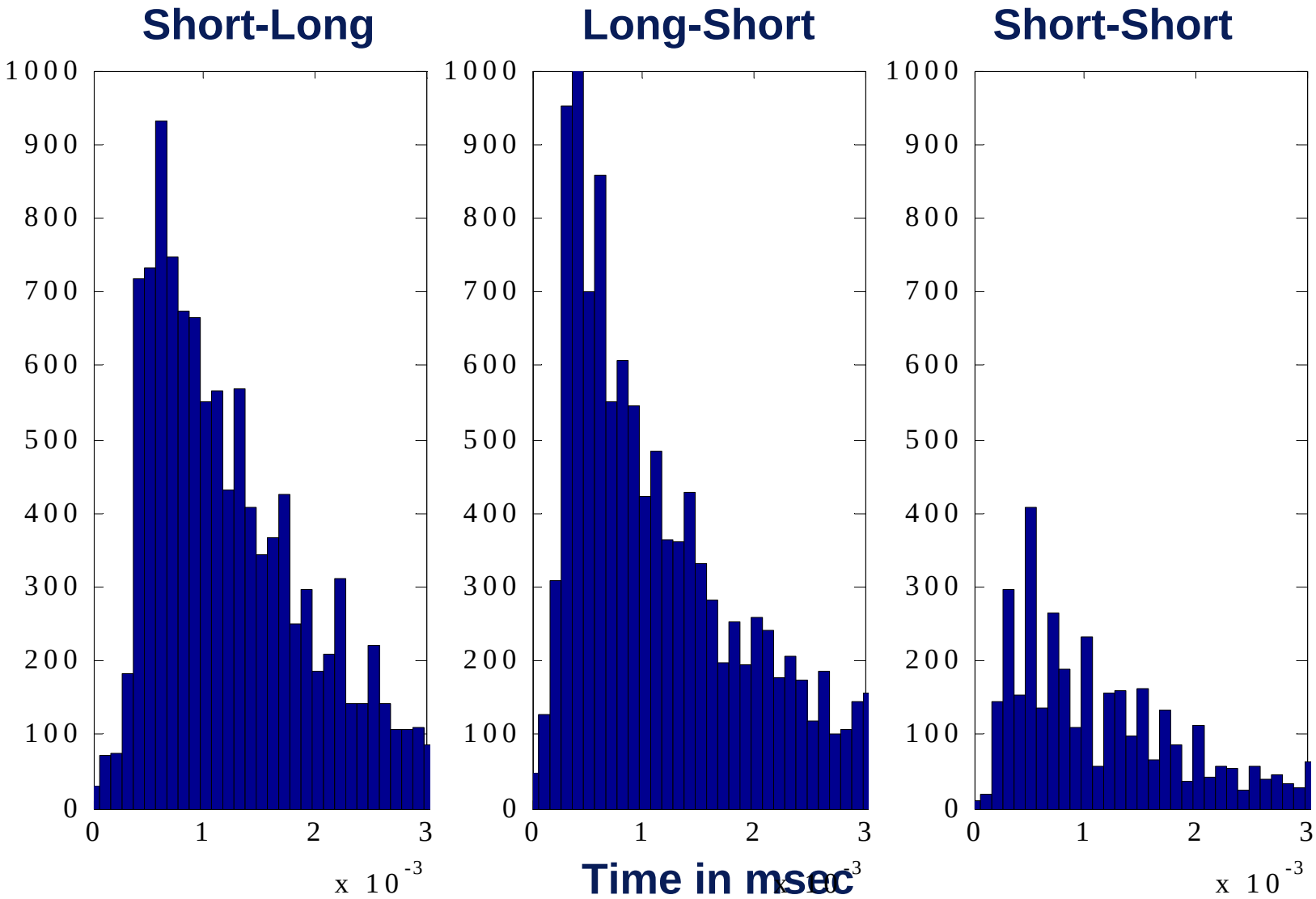
# Histogram of the Time Difference for Successive Successful Messages for A2 High Rx in LA



# Histogram of the Time Difference for Successive Successful Messages for A3 at FL 150 in LA



# Histogram of the Time Difference for Successive Successful Messages for A2 at High Altitude in CE



# Histogram of the Time Difference for Successive Successful Messages for A3 at FL 150 in CE