


Data Link Performance

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Data link performance

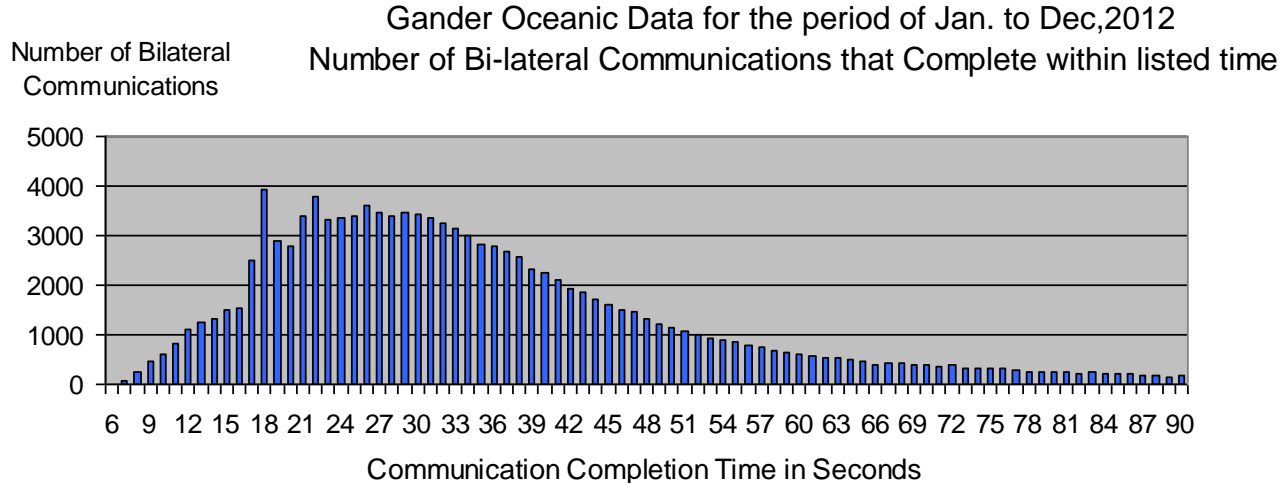
Outline

- What we know about data link performance
- What we would like to learn about data link performance

What we have learned about data link performance.

- Distribution of CPDLC Bi-lateral communication
- Pilot reaction time varies according to message type and purpose
- Aircraft type appears to be a factor of data link performance
- High speed SATCOM channel is a factor of data link performance

Distribution of CPDLC bi-lateral communication



- The most popular bi-lateral communication completion time is 18 seconds.
- Most (84%) of the bi-lateral communication complete in 60 seconds .
- Messages continue to exist for several minutes, message latency (or timeout) to shorten message “keep alive” may improve performance.

Some operators have better data link performance than others

Comparing operators CPDLC Data between January to December 2012

operator	Total Messages	Percentage of Bi-lateral Communication completed within	
		30 sec	60 sec
operator A	7774	72.14	94.7
operator B	4480	65.54	88.39
operator C	12109	63.97	91.68
operator D	9982	46.85	91.29
operator E	16956	41.27	80.29
operator F	3525	37.02	79.83
operator G	5177	34.27	81.5
operator H	20610	30.82	79.52
operator I	4874	30.71	73.12
operator J	4198	25.66	86.28

- Some operators have better data link performance than others

Pilot reaction time is dependent on the CPDLC message

Gander Oceanic CPDLC Data between January to December 2012

Uplink Message Number	Message	Total Messages	Percentage of Bi-lateral Communication completed within :	
			30 sec	60 sec
U119	at time contact unit frequency	90106	42.02	83.57
U027 U129	climb to reach level by position report level	20401	40.74	85.153
U020 U129	climb to and maintain altitude report level	8784	55.15	89.31
U111	increase speed to	1984	70.06	91.73
U113	decrease speed to	1911	73.05	92.41
U027 U129 U169	climb to reach level by position report level freetext	1628	20.82	70.15
U020 U129 U169	climb to and maintain altitude report level freetext	692	38.15	81.79
U082 U127	cleared to deviate up to distance of route report reaching	530	65.28	91.51
U026 U129	stop altitude squawk	495	47.88	88.48
U117	contact unit frequency	297	54.21	82.15

- Speed clearances are completed within 30 second ~70% of time

- Flight level clearances are complete within 30 seconds from 20 -55% of the time

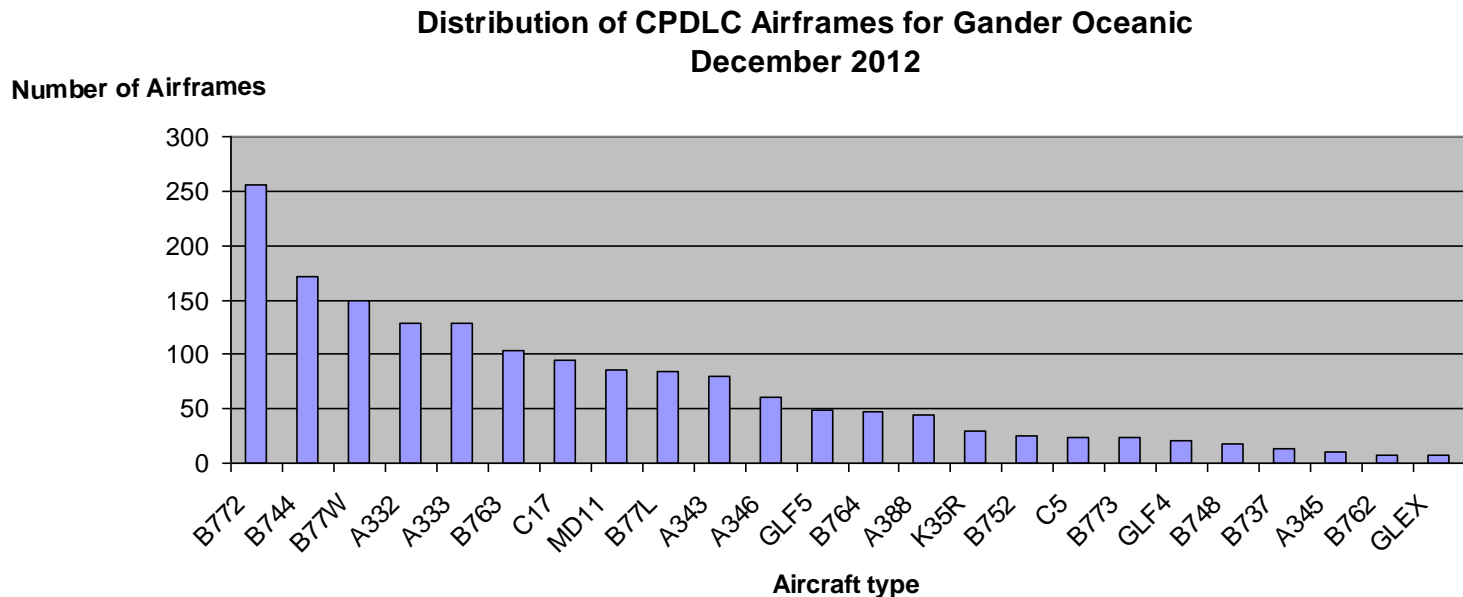
Equipment type appears to be a factor of data link performance

Gander Oceanic CPDLC Data between January to December 2012

Aircraft Type	Total Messages	Percentage of Bi-lateral Communication completed within :	
		30 sec	60 sec
B772	24008	62	90.17
A333	19373	34.51	79.57
A332	13728	38.86	84.05
B744	11134	38.67	85.29
B763	8690	38.91	83.61
B77W	8644	60.25	89.46
B764	8444	29.09	79.76
A343	7072	46.13	87.98
B752	5941	29.59	73.78
A346	4440	44.57	88.31
B77L	3759	53.47	87.42
A388	3235	55.3	88.07
MD11	2040	28.14	80.74
B773	706	59.21	88.95
B777	308	60.39	86.69
A345	260	61.54	94.23
A310	224	17.86	85.27
B747	51	66.67	96.08

- A345, B772, B77W, B777, B747 have bi-lateral communication completion time within 30 seconds more than 60% of the time

Distribution of Aircraft Types performing CPDLC in Gander Oceanic



Use of High speed SATCOM channel is a factor of data link performance

Comparing operators for Gander Oceanic CPDLC Data between January to December 2012

Remote Ground Station	Type	Total Messages	Percentage of Bi-lateral Communication completed within :		
			30 seconds	60 seconds	operator
XXE	SATCOM	1555	57.23	85.53	operator B
XXE	SATCOM	2152	11.43	65.24	operator I
XXE	SATCOM	1673	18.95	69.64	operator J
AOE2	SATCOM	2111	68.12	92.94	operator A
AOE2	SATCOM	493	25.76	87.63	operator I
AOW2	SATCOM	576	69.97	91.49	operator A
AOW2	SATCOM	4987	19.57	79.37	operator I

- High speed SATCOM channel is provided to aircraft with high speed equipment.
- Companies with high performing FANS equipment have better performance at the 30 second mark for the remote ground stations

What we would like to learn about data link performance

- Is there a difference in data link performance between the uplink and the downlink?
 - Effect of VHF retries
 - AOC messages in queue holding up ATC messages
 - Performance of SITA/ARINC find aircraft algorithms
- What is the performance in SATCOM areas only (middle of the ocean)?
 - Location of best/worse performance
 - Effect of VHF retries
- Do messages with “emergency” tag have a better data link performance?