APEX3 Gaseous Emissions

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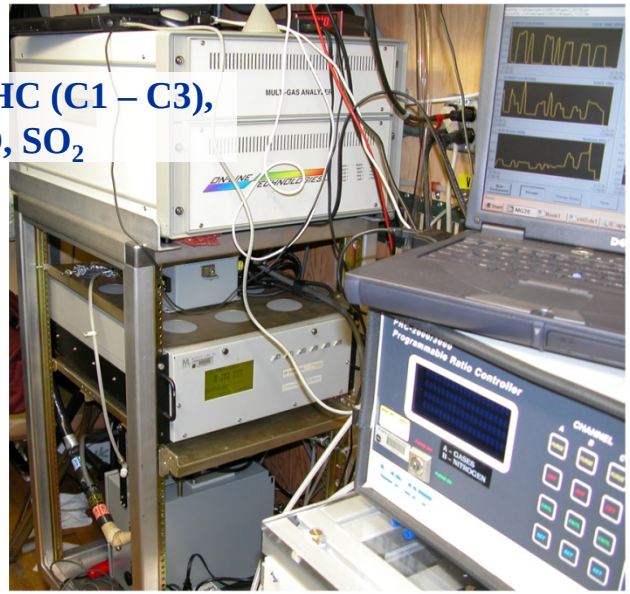
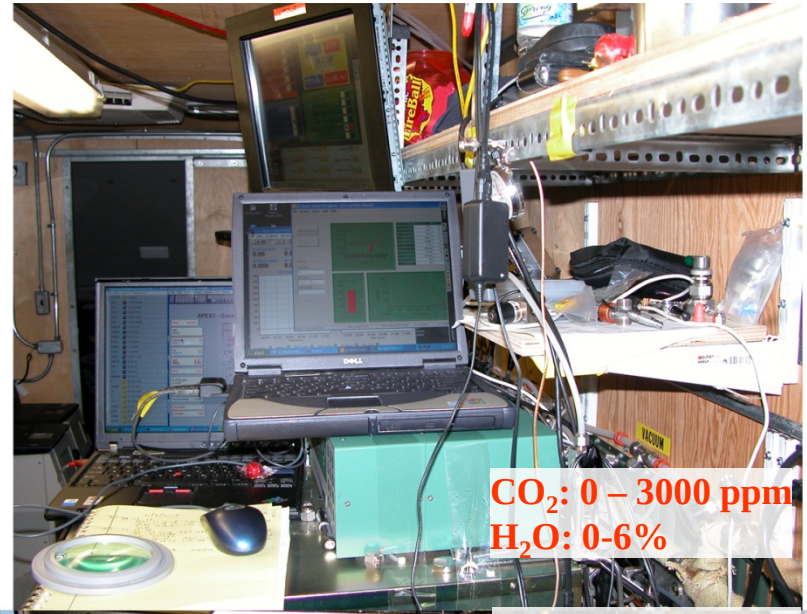
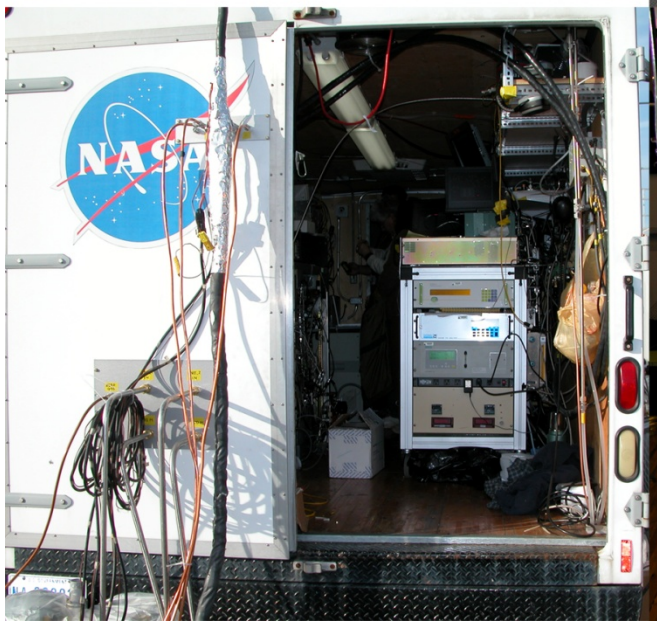
APEX3 Conference
November 29 - December 1, 2006, Cleveland, OH

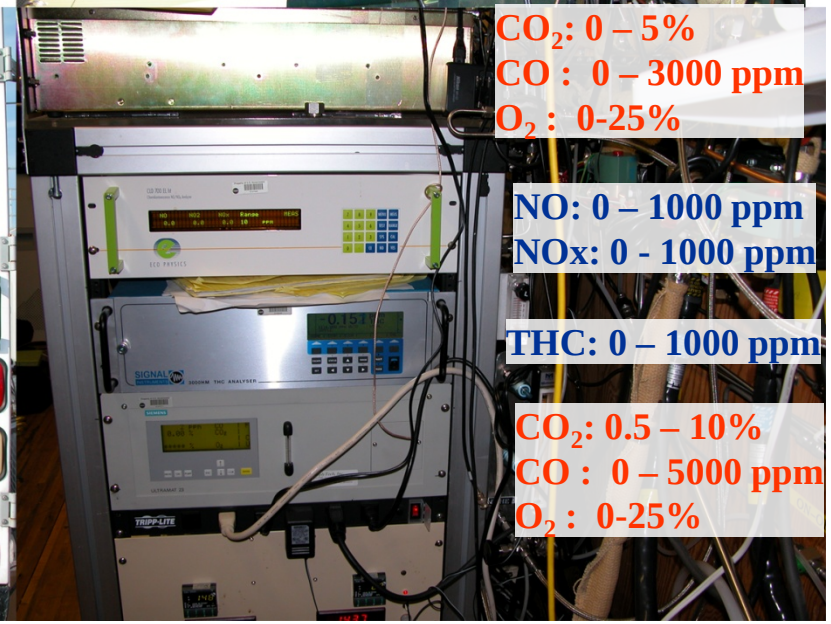
Light HC (C1 – C3), HONO, SO_2





CO_2: 0 – 3000 ppm
H_2O: 0-6%





CO_2: 0 – 5%
CO : 0 – 3000 ppm
O_2 : 0-25%

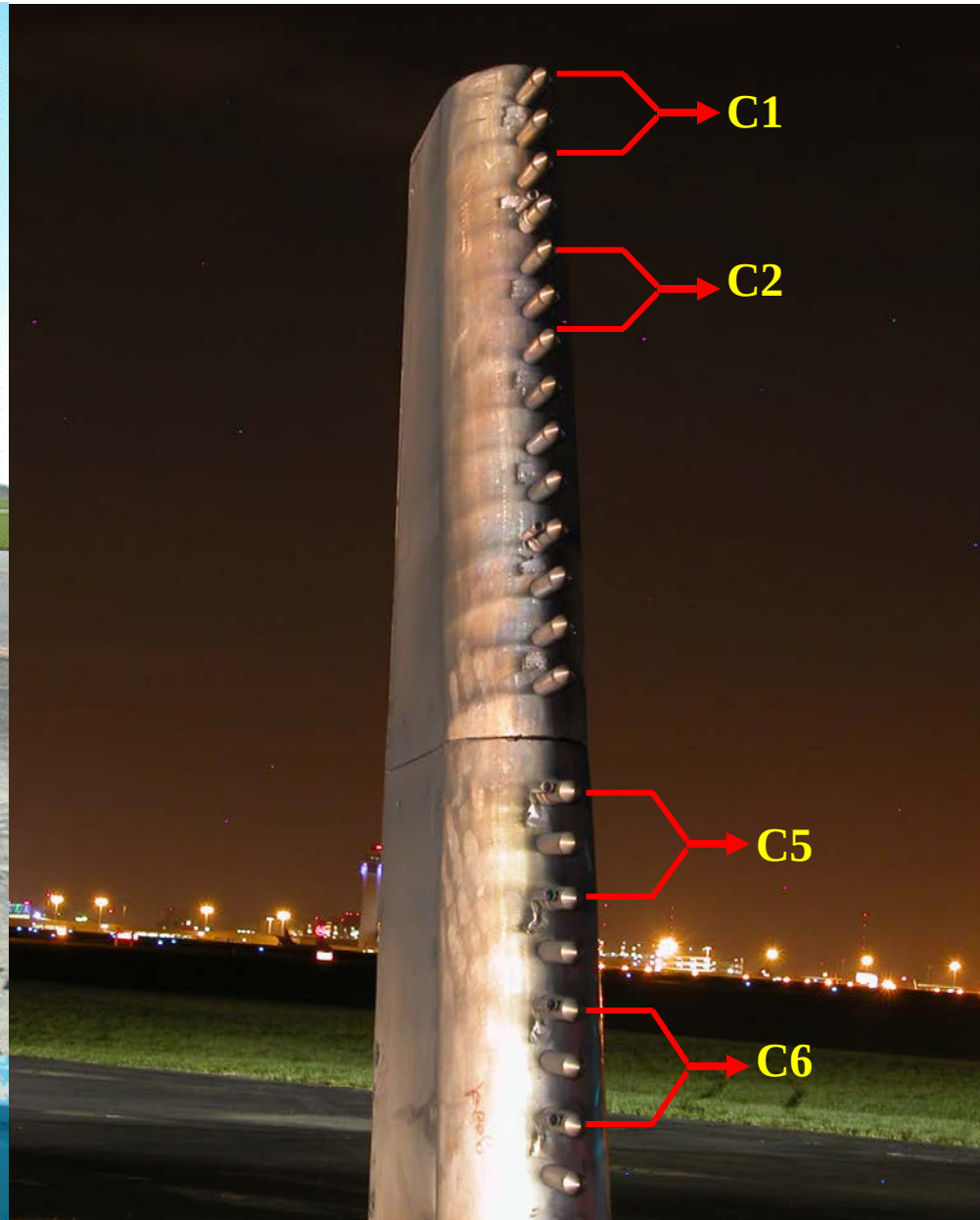
NO: 0 – 1000 ppm
NOx: 0 - 1000 ppm

THC: 0 – 1000 ppm

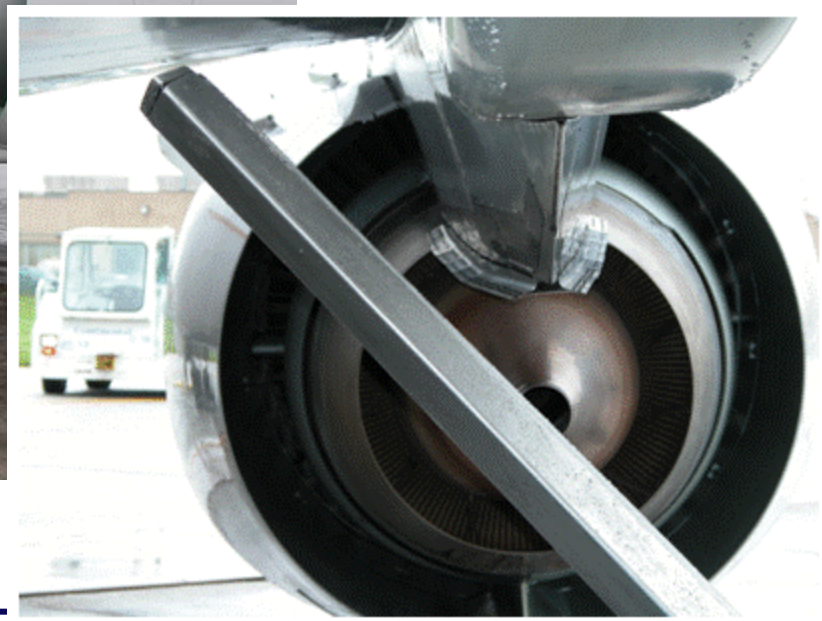
CO_2: 0.5 – 10%
CO : 0 – 5000 ppm
O_2 : 0-25%

APEX3 Test Summary

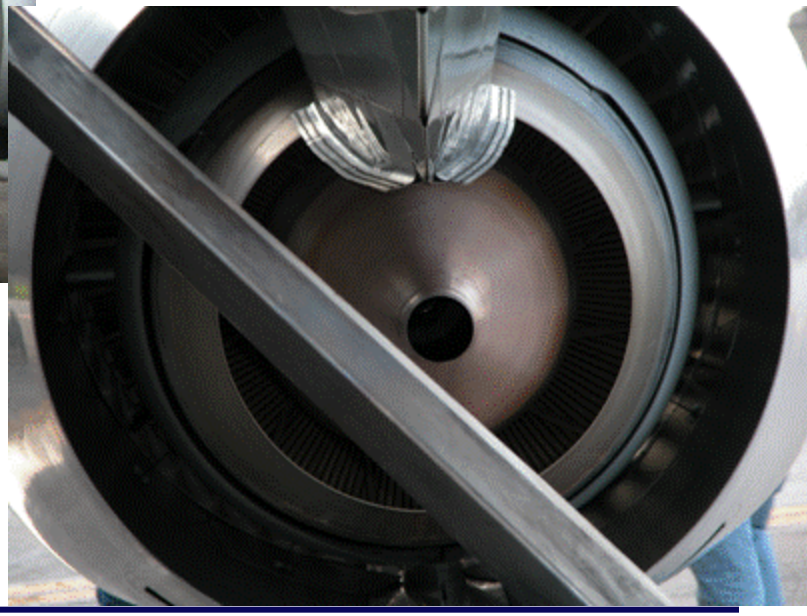
Test	Date (2005)	Time (EST)	Aircraft	F/N (Registration)	Engine	ESN	First Flight
1	11/1	13:34–19:08	B737-3T0	324 (N14324)	CFM56-3B1	7945	July 1986
2	11/3	15:44 -18:36	Learjet 25	NASA 616	CJ610-8ATJ		
3	11/3	22:31 -00:44	ERJ-145 XR	193 (N11193)	AE3007-A1E	312846	Oct. 2005
4	11/4	01:18 -03:10	ERJ-145 XR	193 (N11193)	AE3007-A1E	312825	Oct. 2005
5	11/4	15:50-18:21	Learjet 25	NASA 616	CJ610-8ATJ		
6	11/5	13:43-16:19	Airbus A300B4-622R	300 (N729FD)	PW4158	7923	July 1992
7	11/5	17:15-18:23	Airbus A300B4-622R	300 (N729FD)	PW4158	7923	July 1992
8	11/5	21:22-23:03	B757-324	853 (N75853)	RB211-535E4B	31839	Jan. 2002
9	11/6	20:25-22:28	B757-324	856 (N74856)	RB211-535E4B	31886	Dec. 2003
10	11/7	00:34-02:11	ERJ-145 ER	927 (N16927)	AE3007-A1P	311058	Dec. 1996
11	11/7	16:15-17:35	B737-3T0	330 (N70330)	CFM56-3B1		Feb. 1986


C1
C2
C5
C6

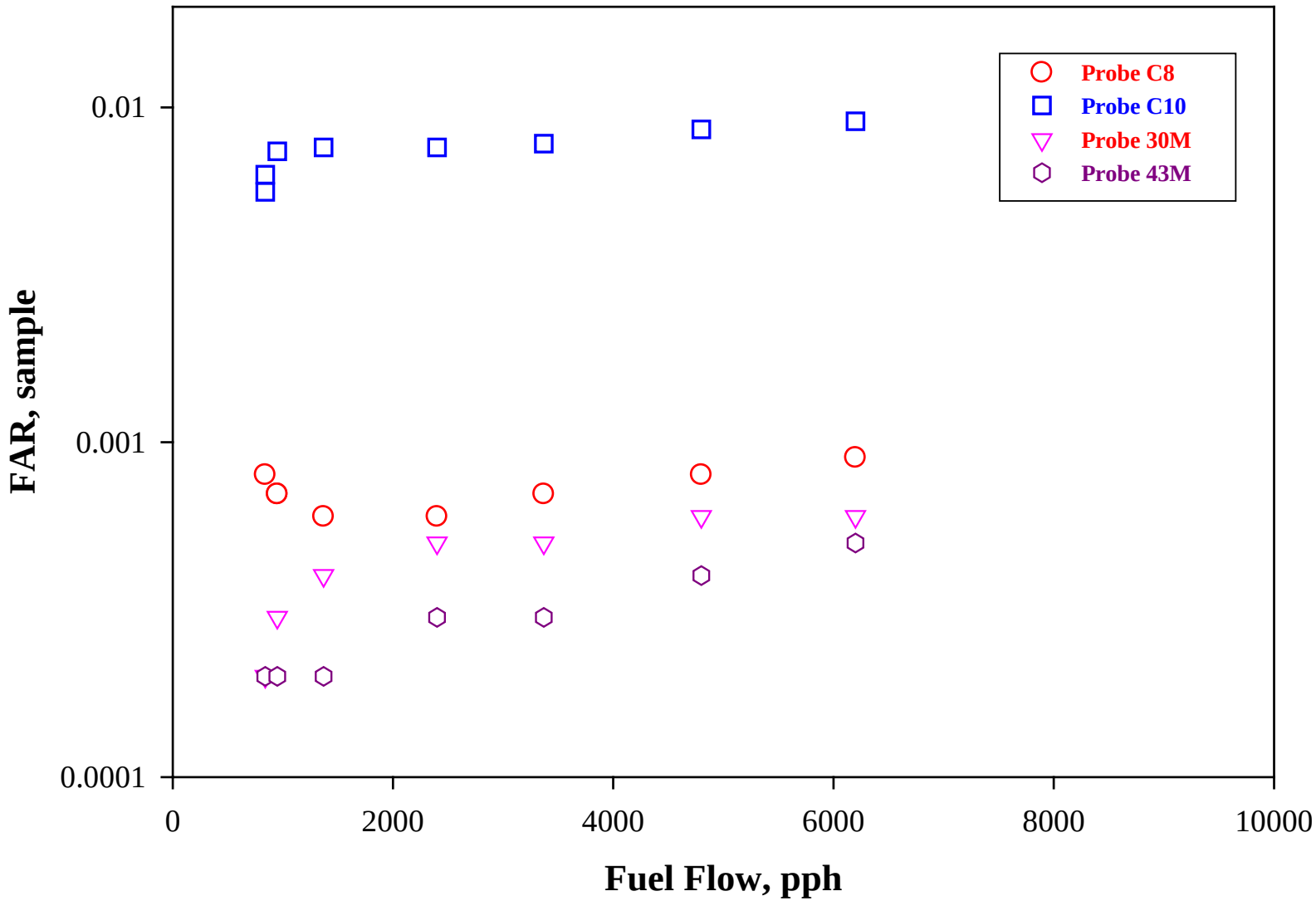
Boeing B737-300 (CFM56-3), 11/1/2005



Boeing B737-300 (CFM56-3) 11/7/2005



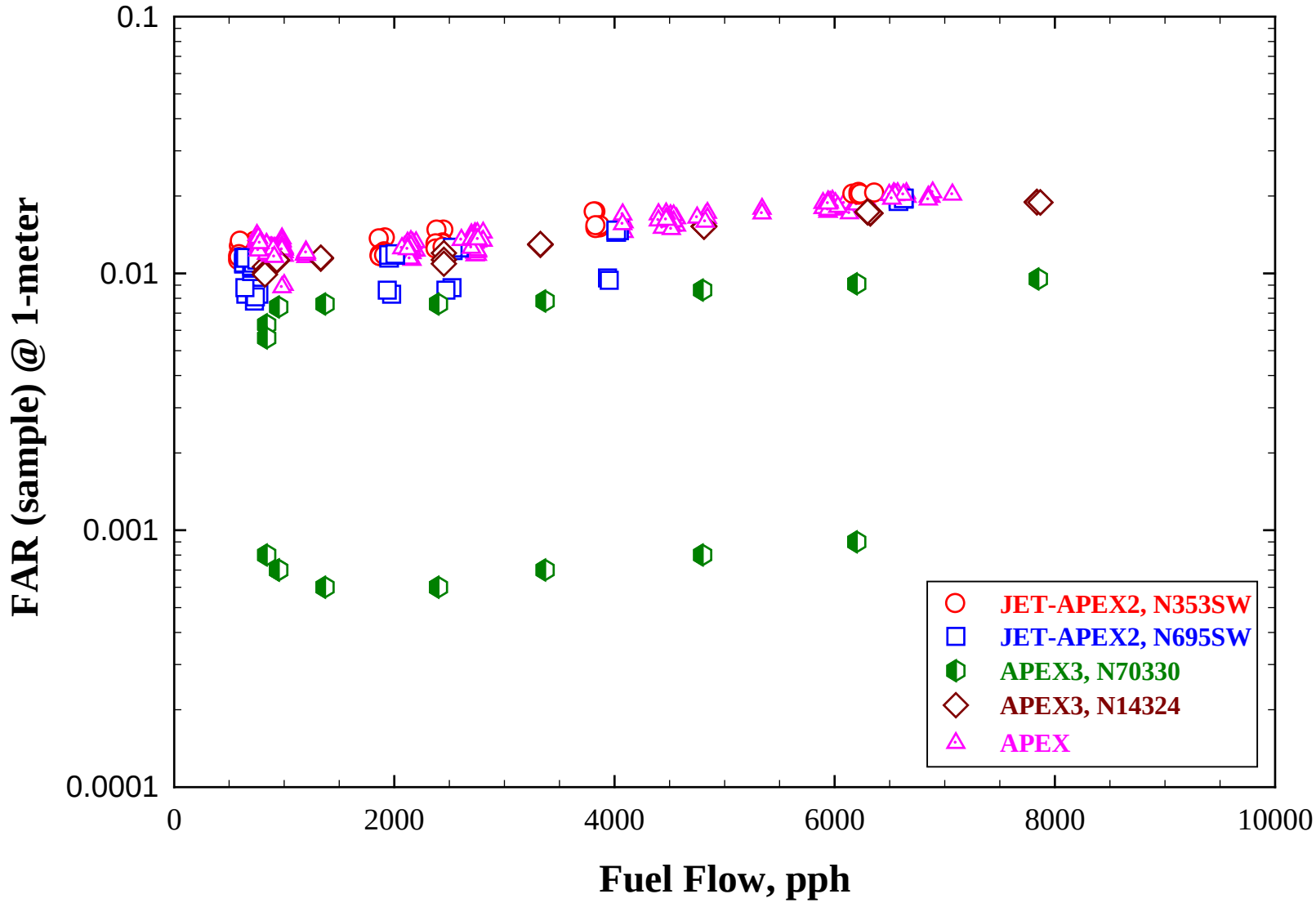
Boeing B737-300 (CFM56-3) 11/7/2005



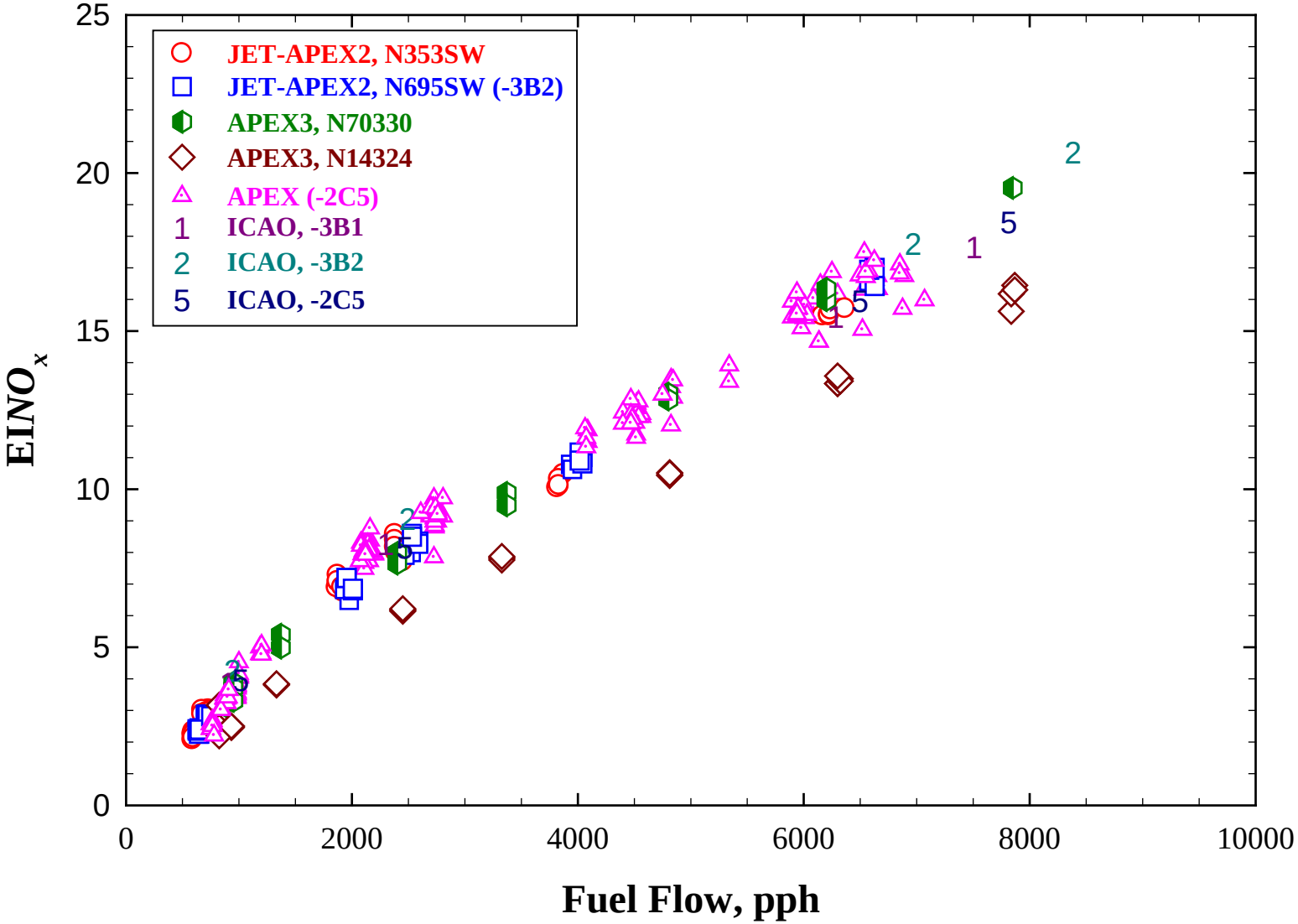
APEX2 Test Summary

Test	Date (2005)	Time (PDT)	Aircraft	Registration	Engine	ESN	First Flight
1	8/23	2:05 – 4:05	B737-7H4	N435WN	CFM56-7B22		May 2003
2	8/23	23:44 – 2:00	B737-3H4	N353SW	CFM56-3B1		Oct. 1990
3	8/24	3:20 – 5:30	B737-3Q8	N695SW	CFM56-3B2		June 1986
4	8/24	23:50 – 2:15	B737–7H4(WL)	N429WN	CFM56-7B22		Dec. 2002

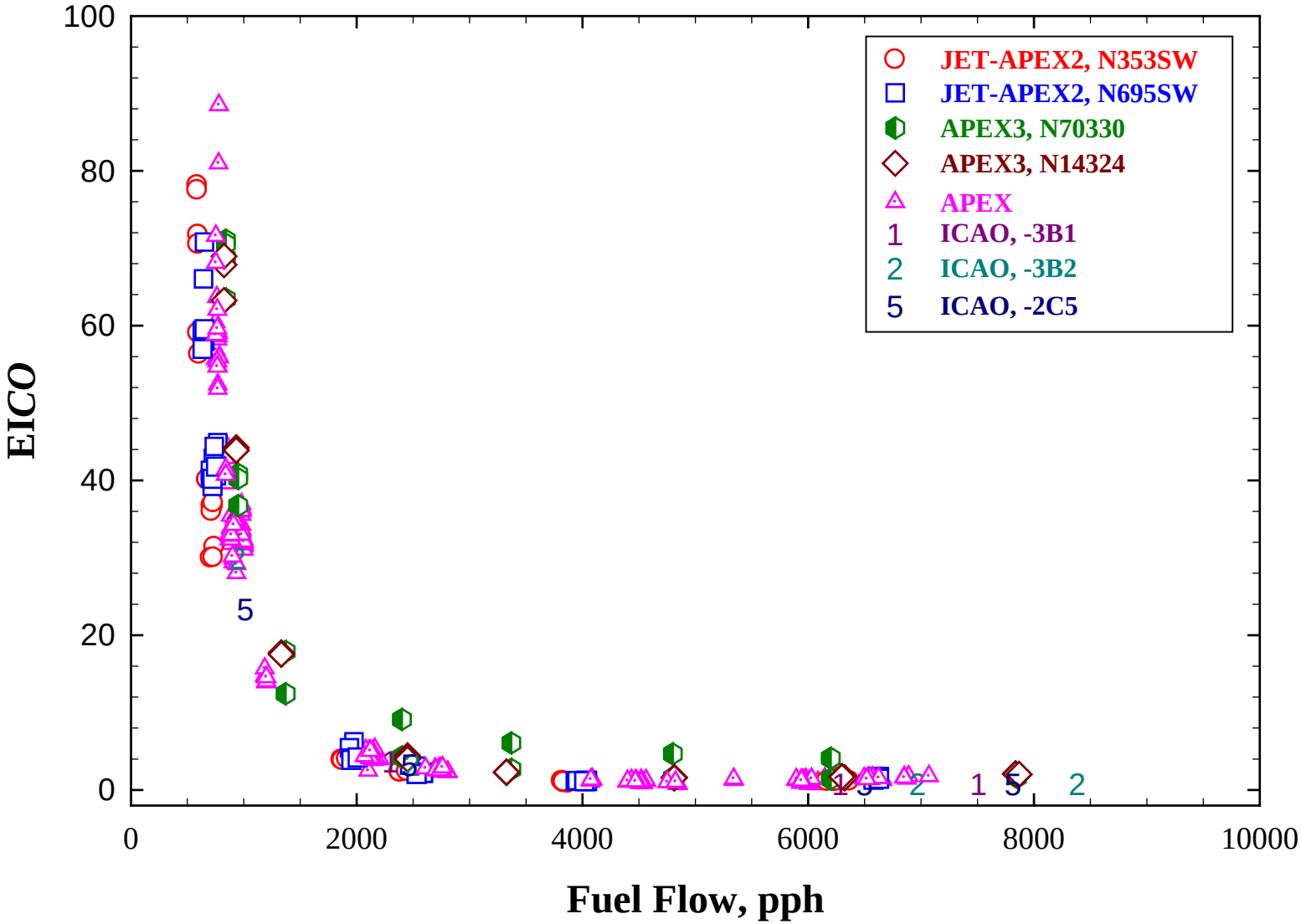
Comparisons of CFM56-3 for APEX, APEX2 & APEX3



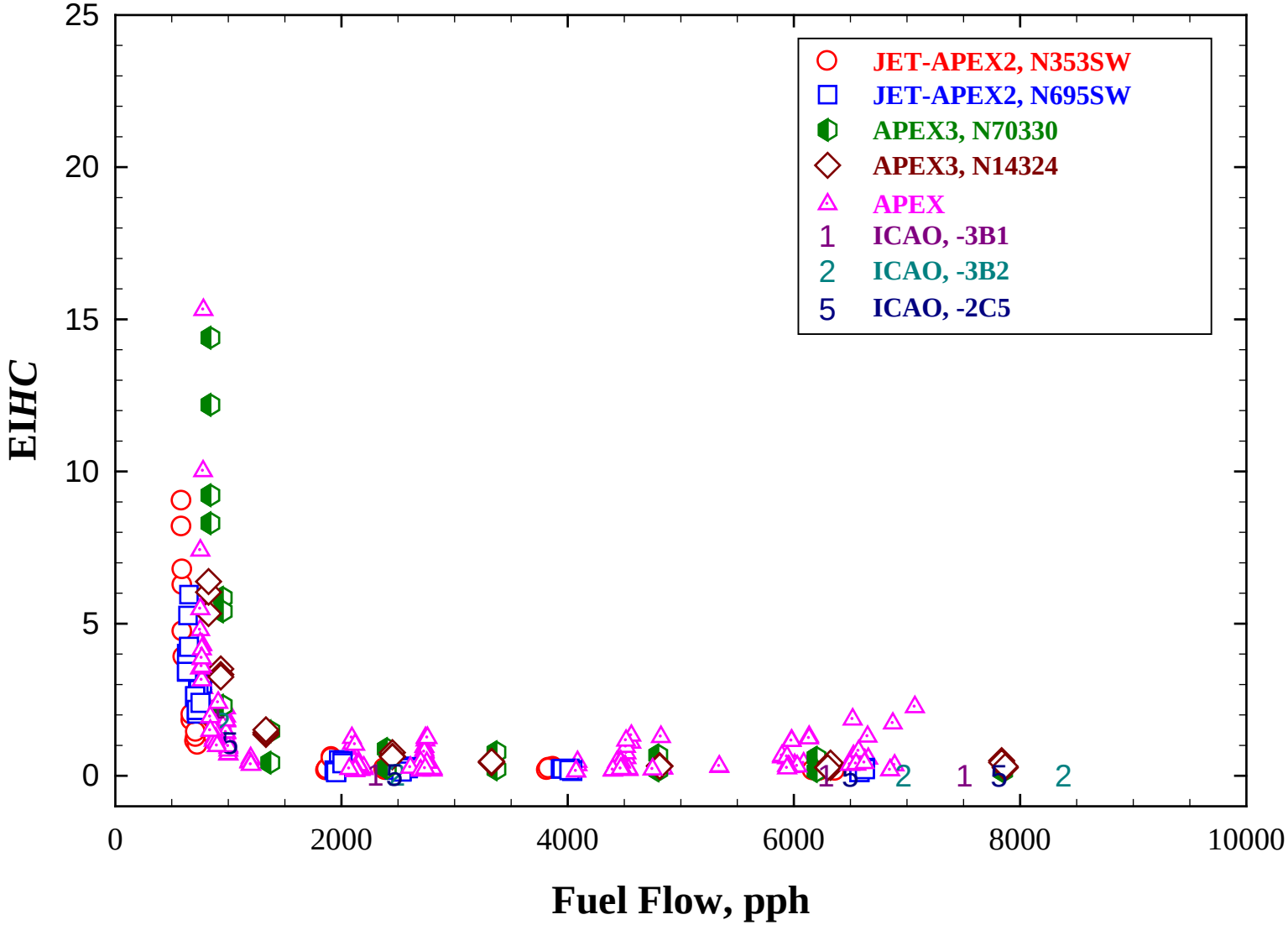
Boeing B737-300 (CFM56-3), EINO_x



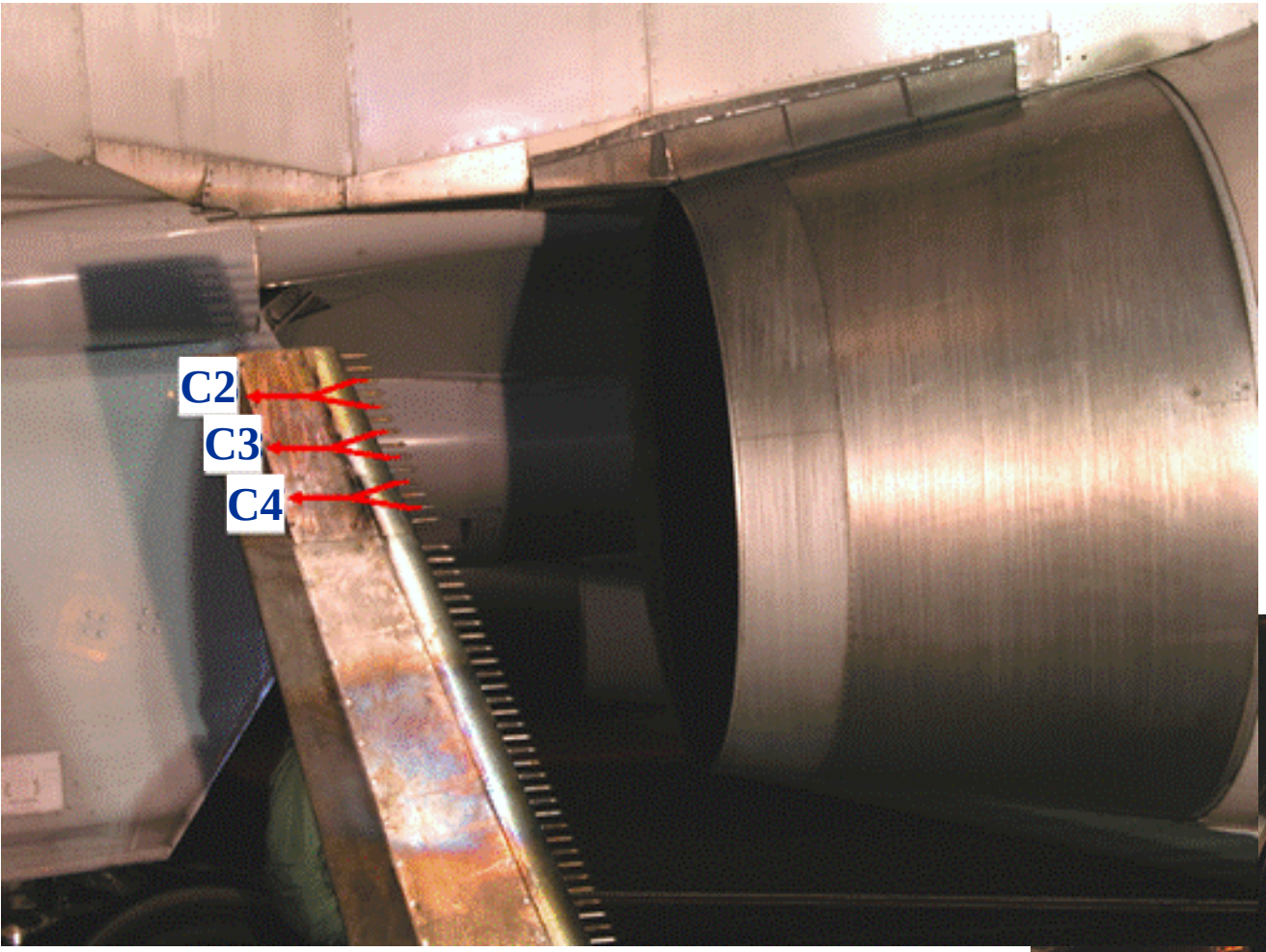
Boeing B737-300 (CFM56-3), EI*CO*



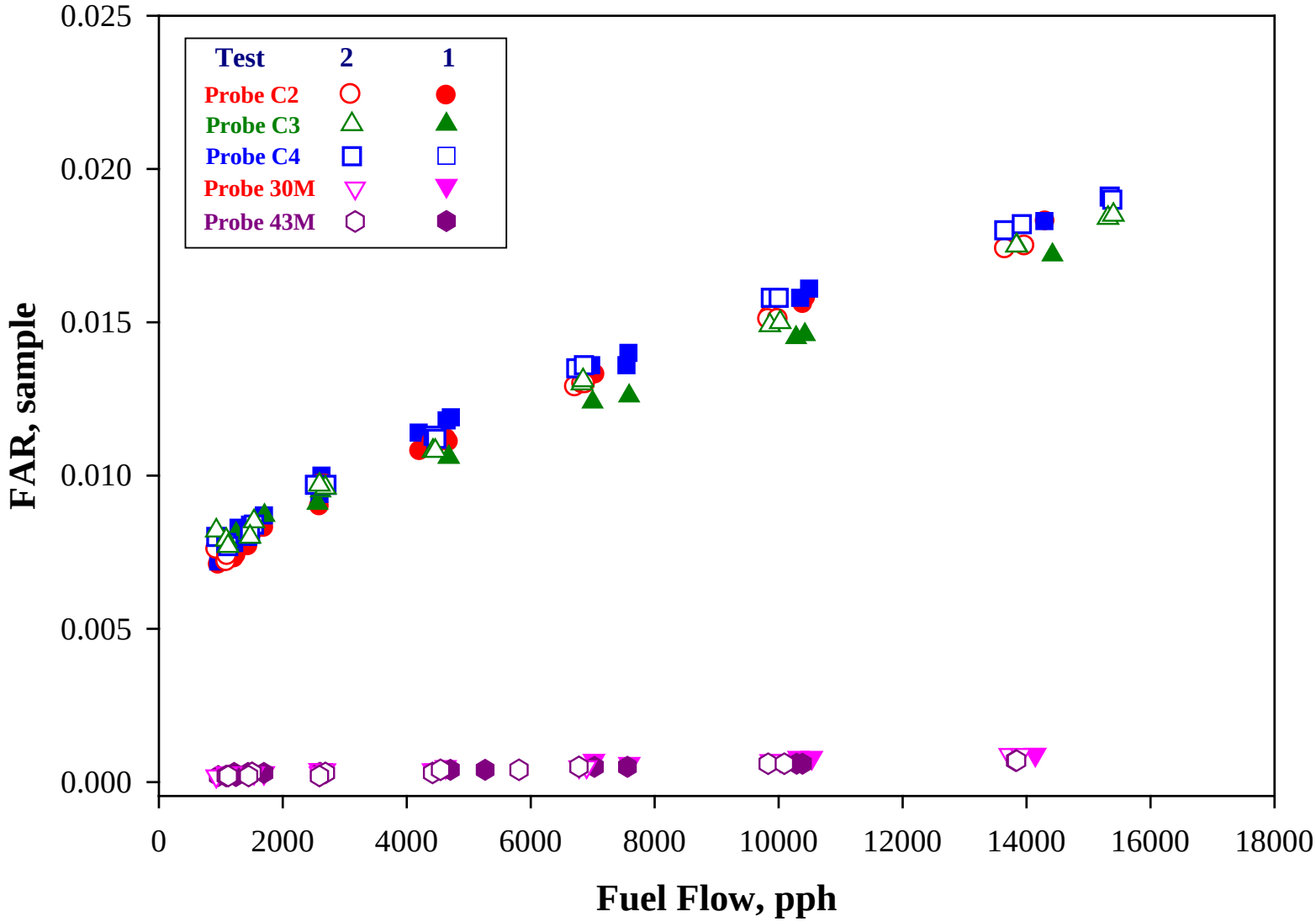
Boeing B737-300 (CFM56-3), EI*HC*



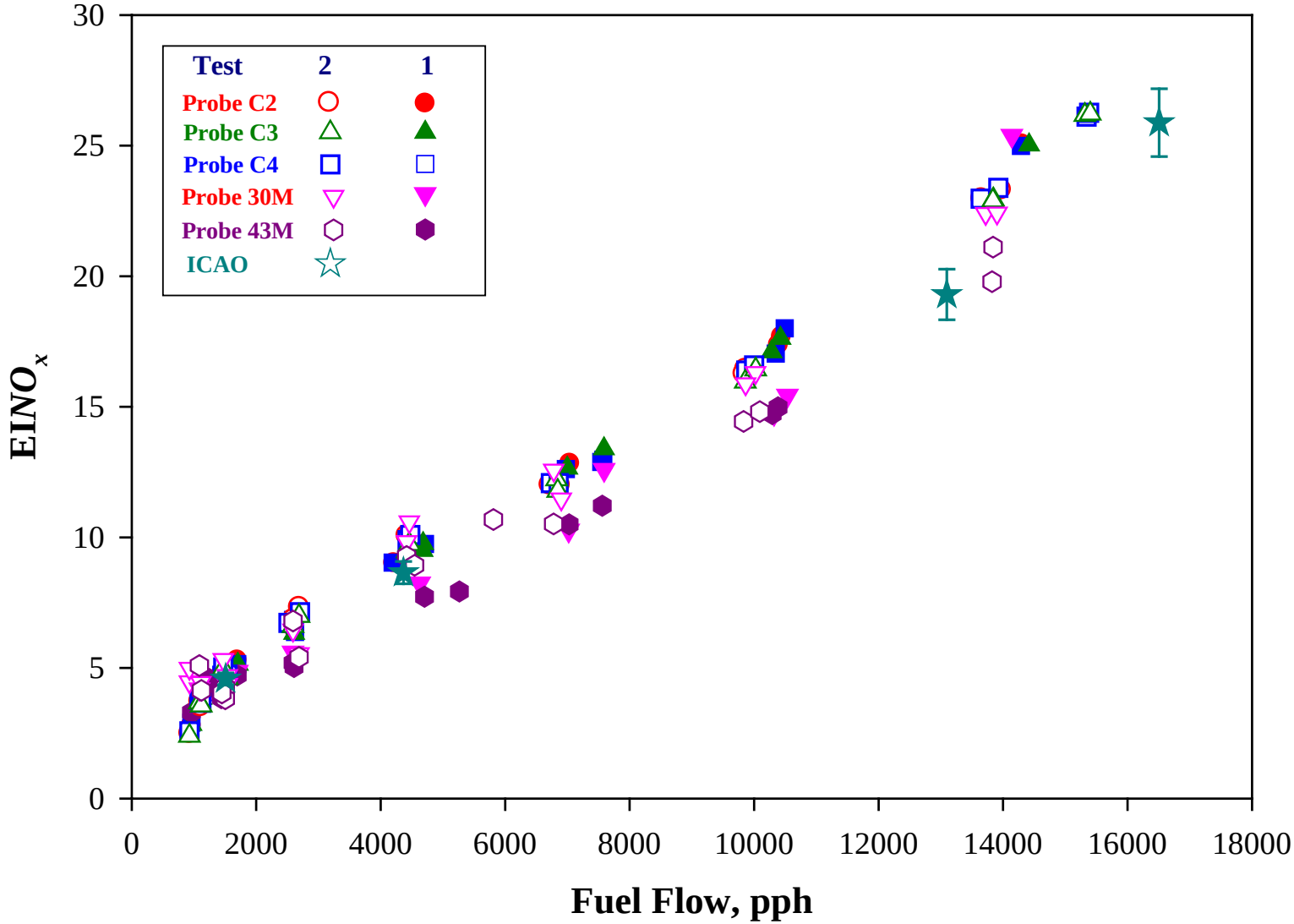
Boeing 757 (RB211-535E4B) 11/5 & 11/6/2005



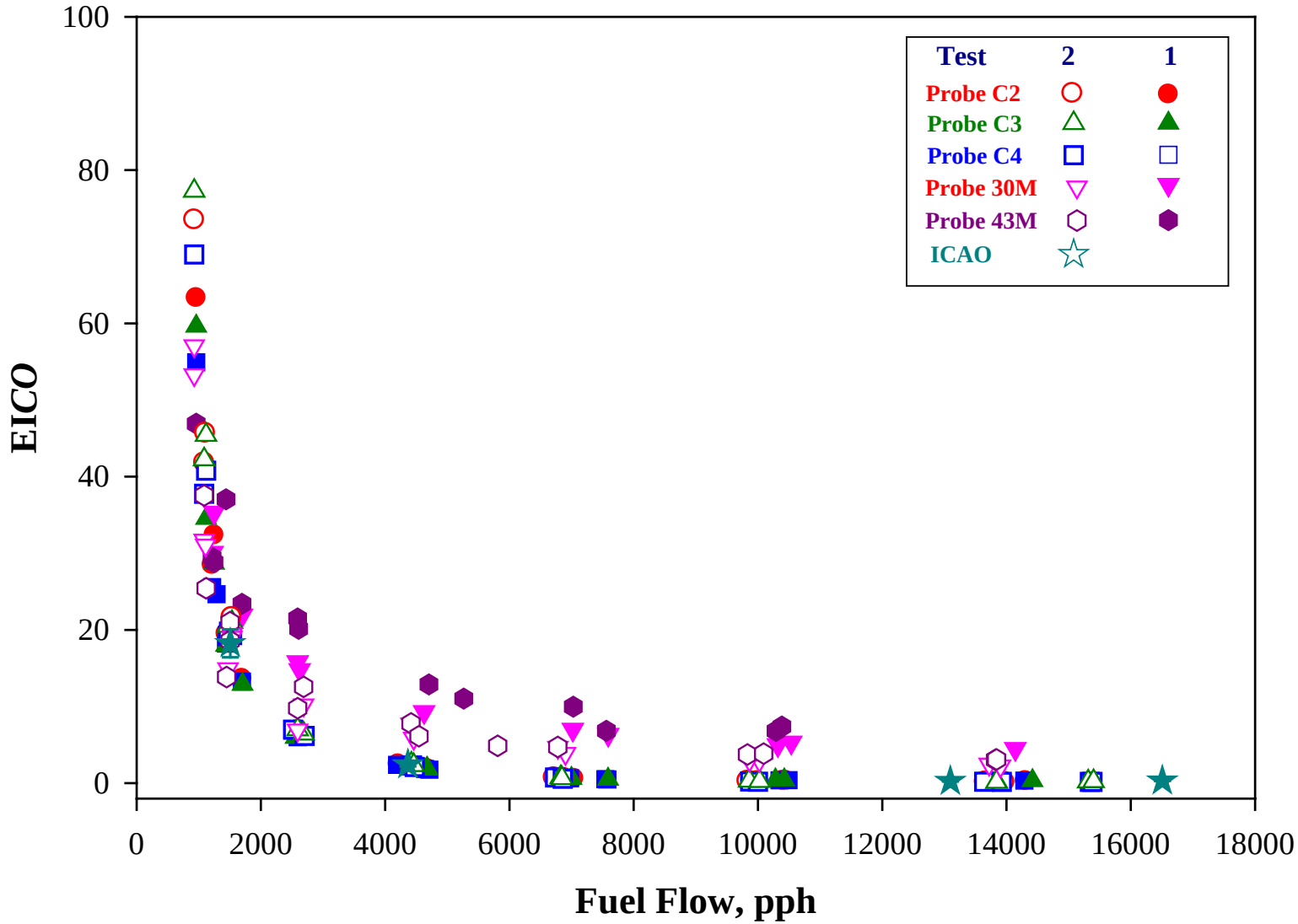
Boeing 757 (RB211-535E4B), FAR



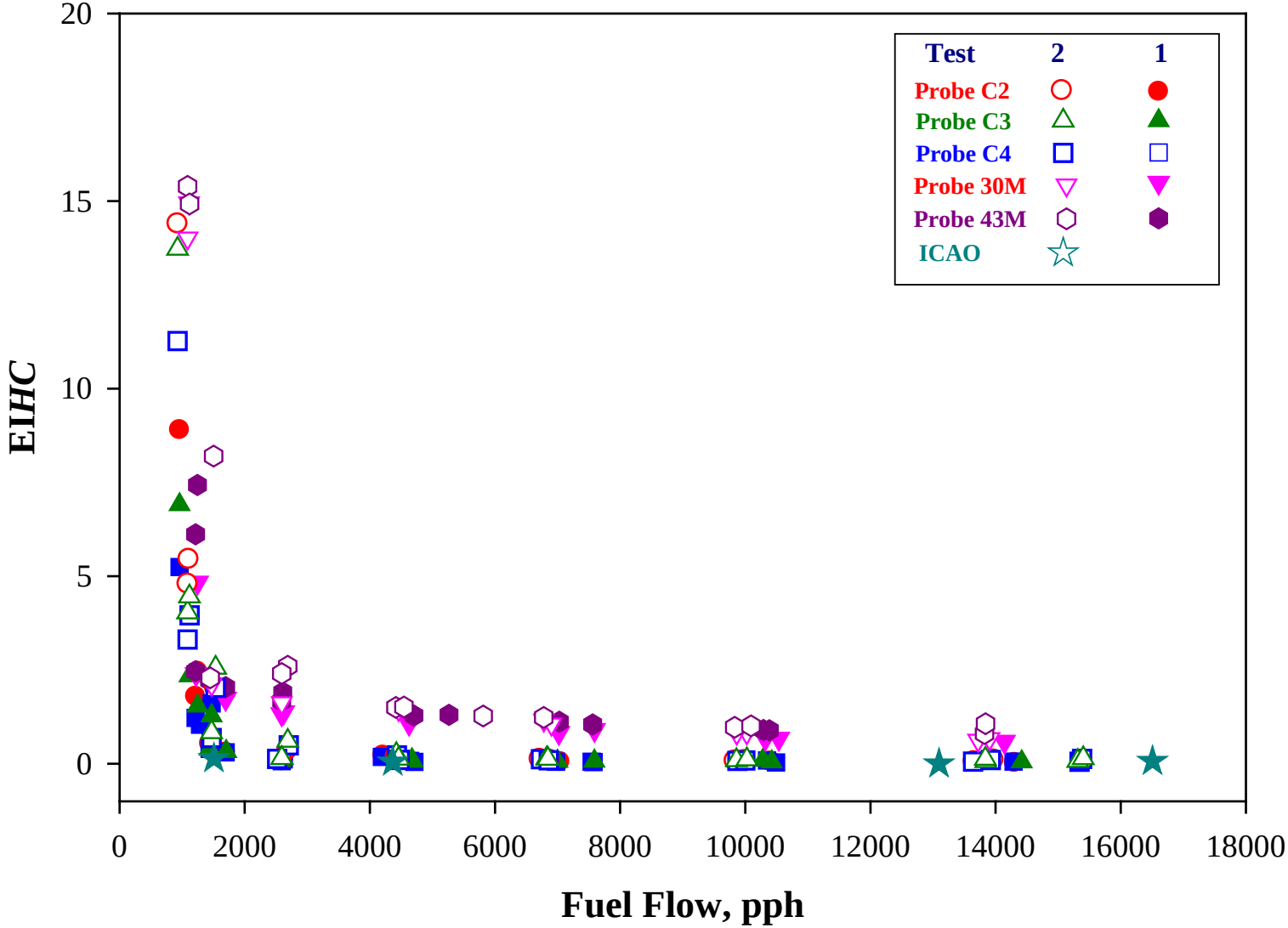
Boeing 757 (RB211-535E4B), EINO_x



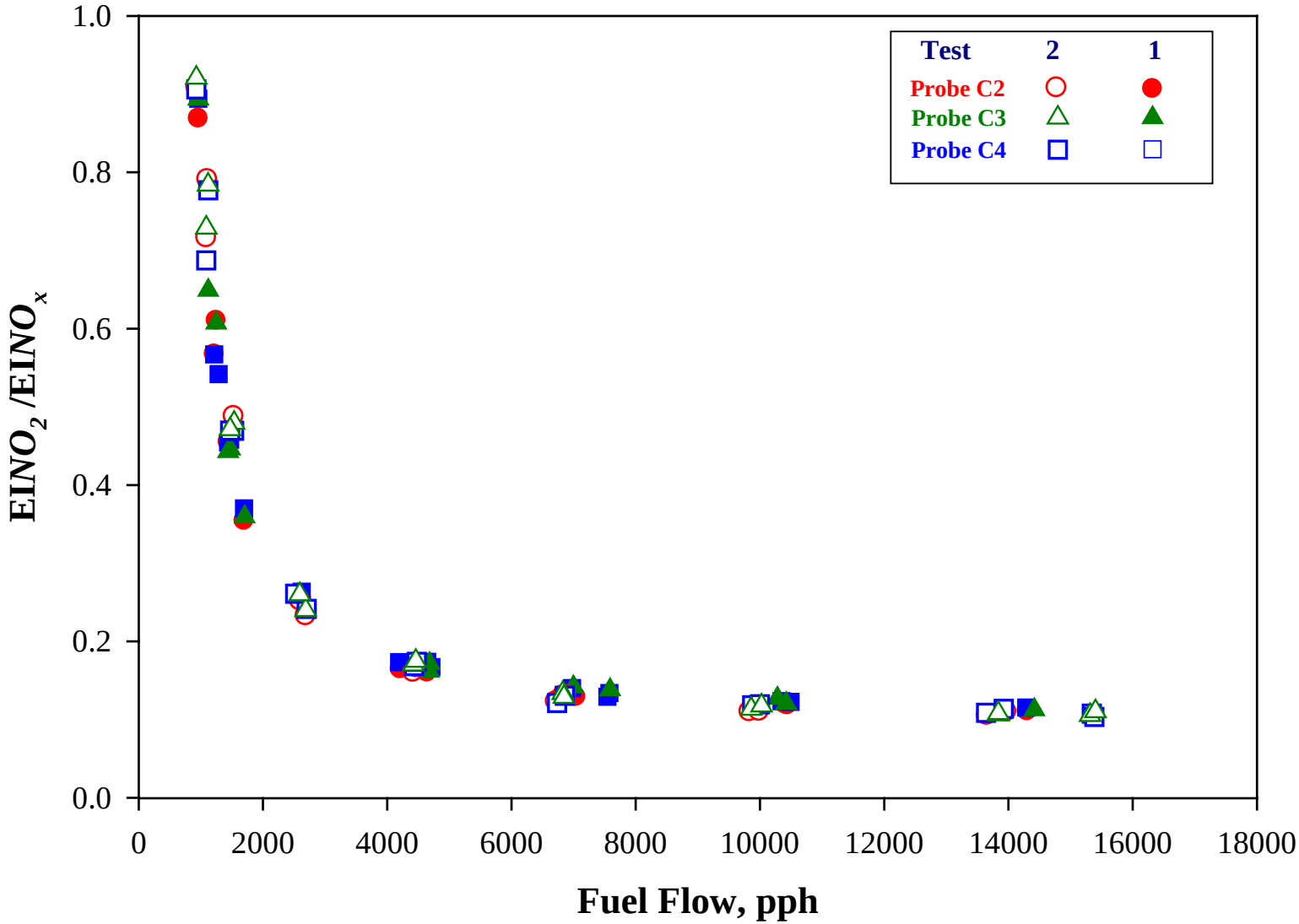
Boeing 757 (RB211-535E4B), EI*CO*



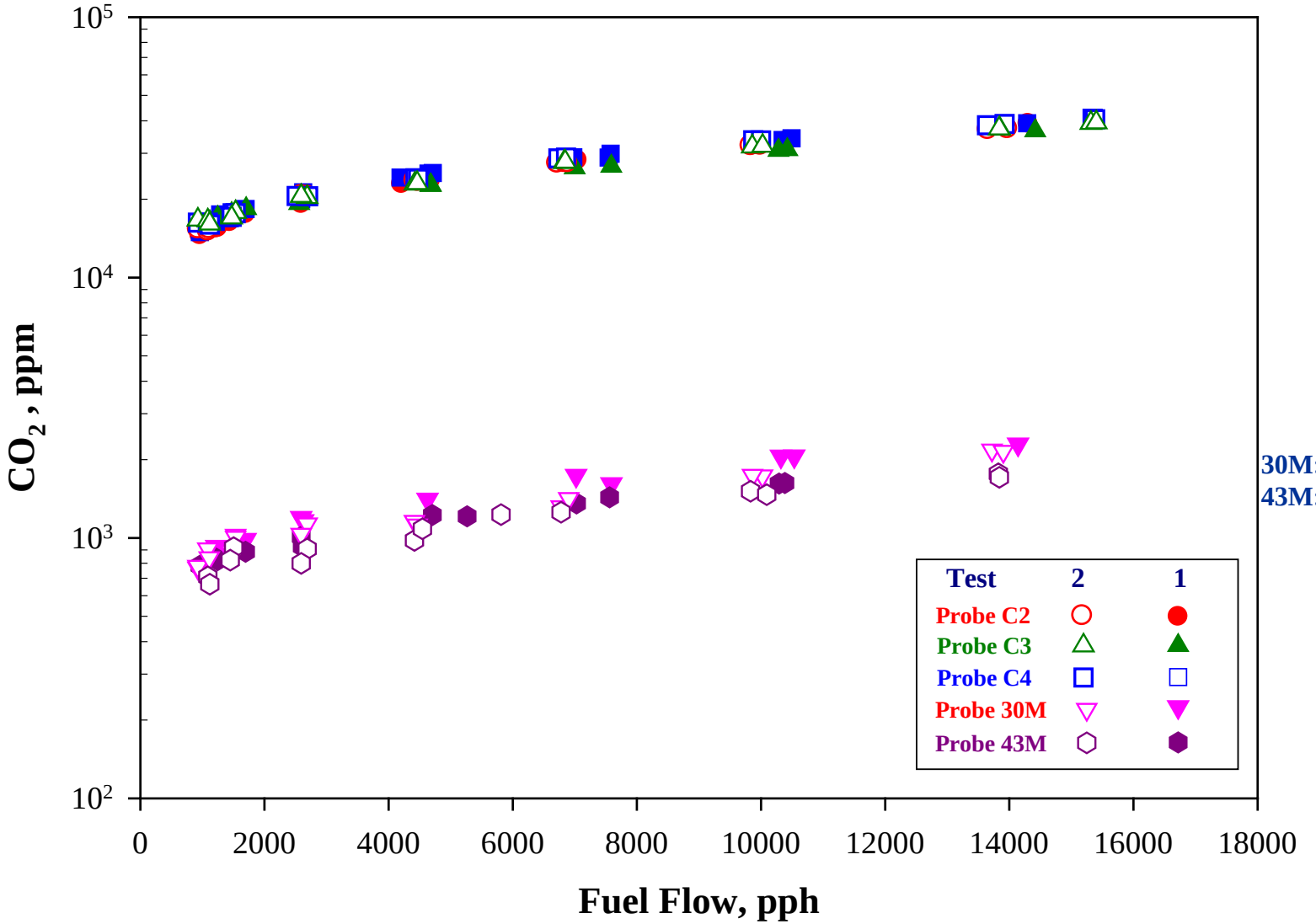
Boeing 757 (RB211-535E4B), EI*HC*



Boeing 757 (RB211-535E4B), $EINO_2/EINO_x$

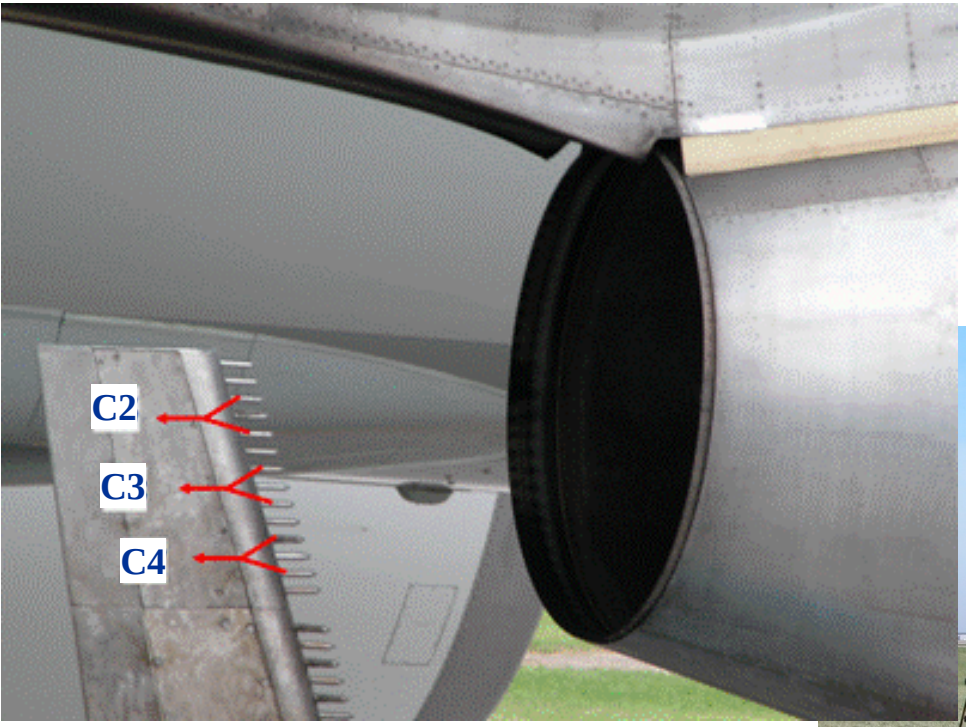


Boeing 757 (RB211-535E4B), CO_2 Comparisons

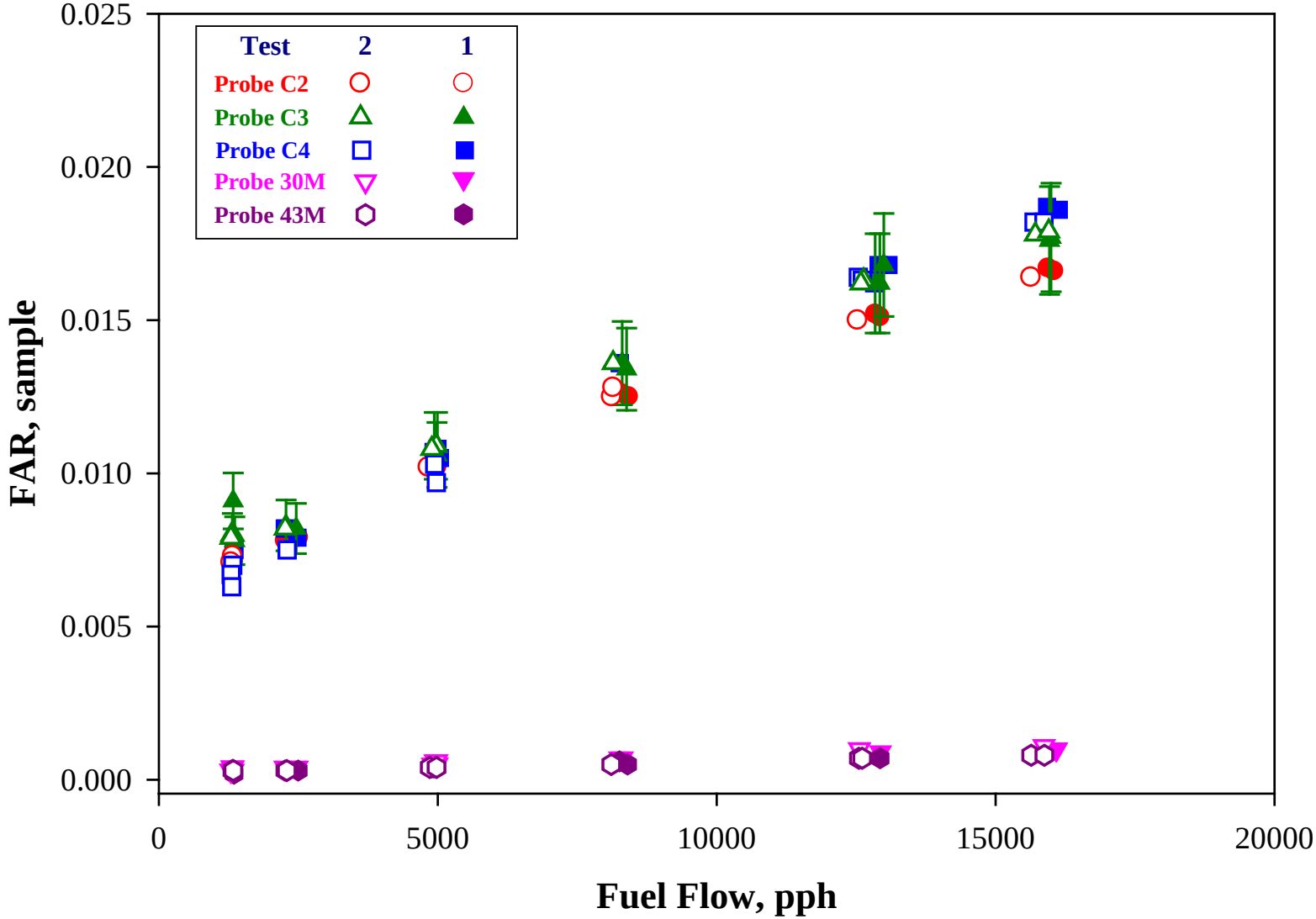


30M: 18.3±1.64
43M: 21.3±1.75

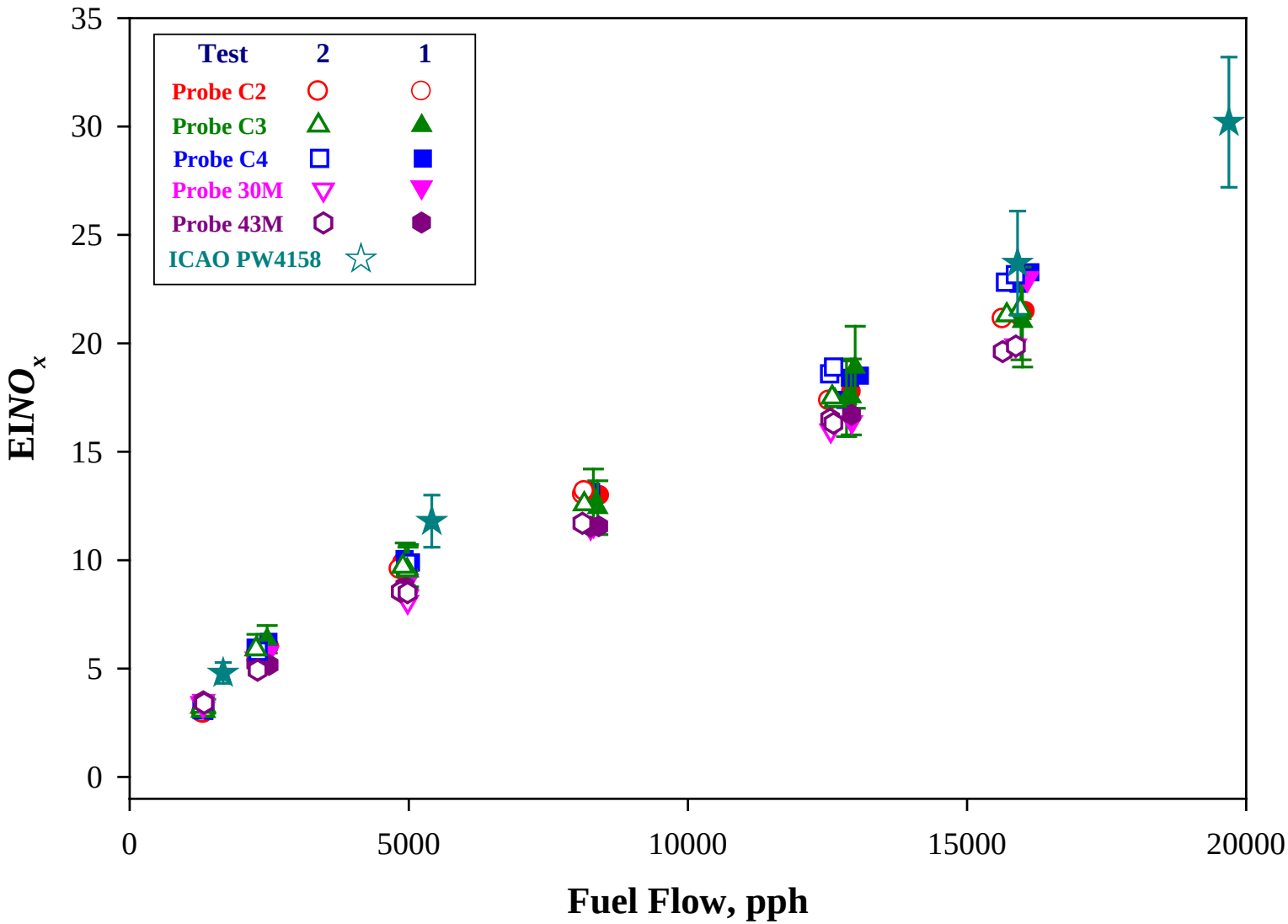
Airbus A300-600 (PW 4158) 11/5/2005



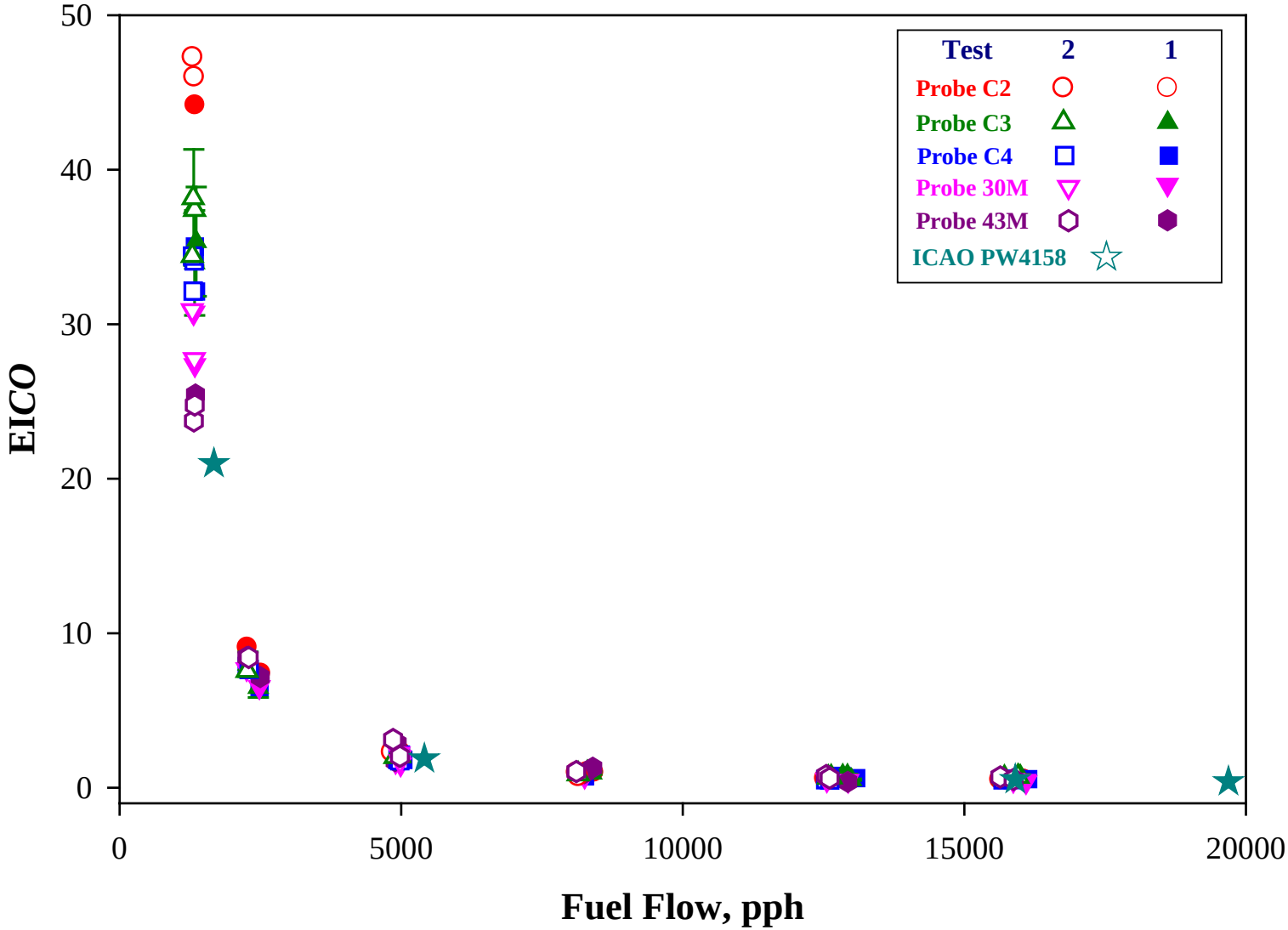
Airbus A300-600 (PW4158), FAR



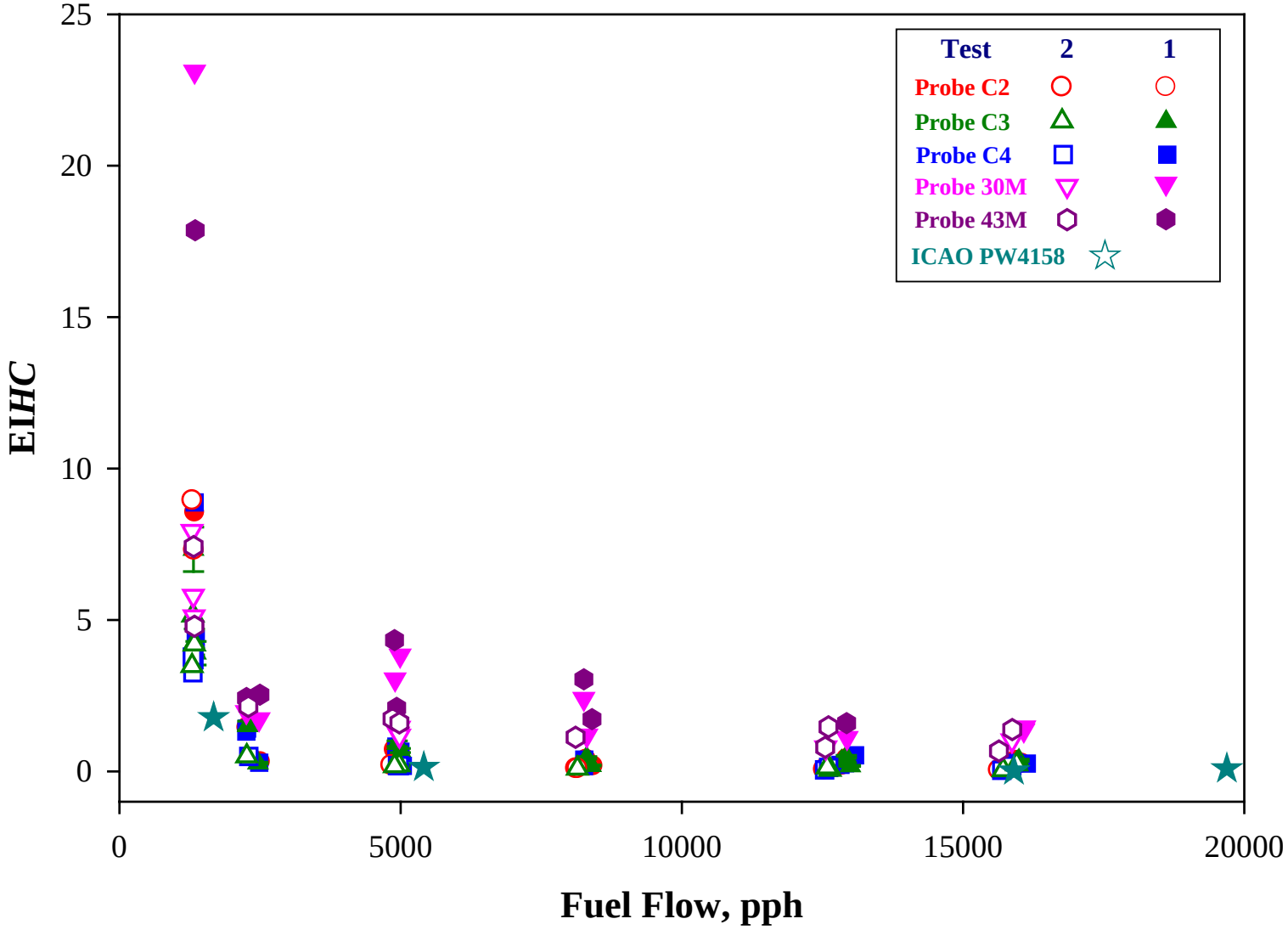
Airbus A300-600 (PW4158), EINO_x



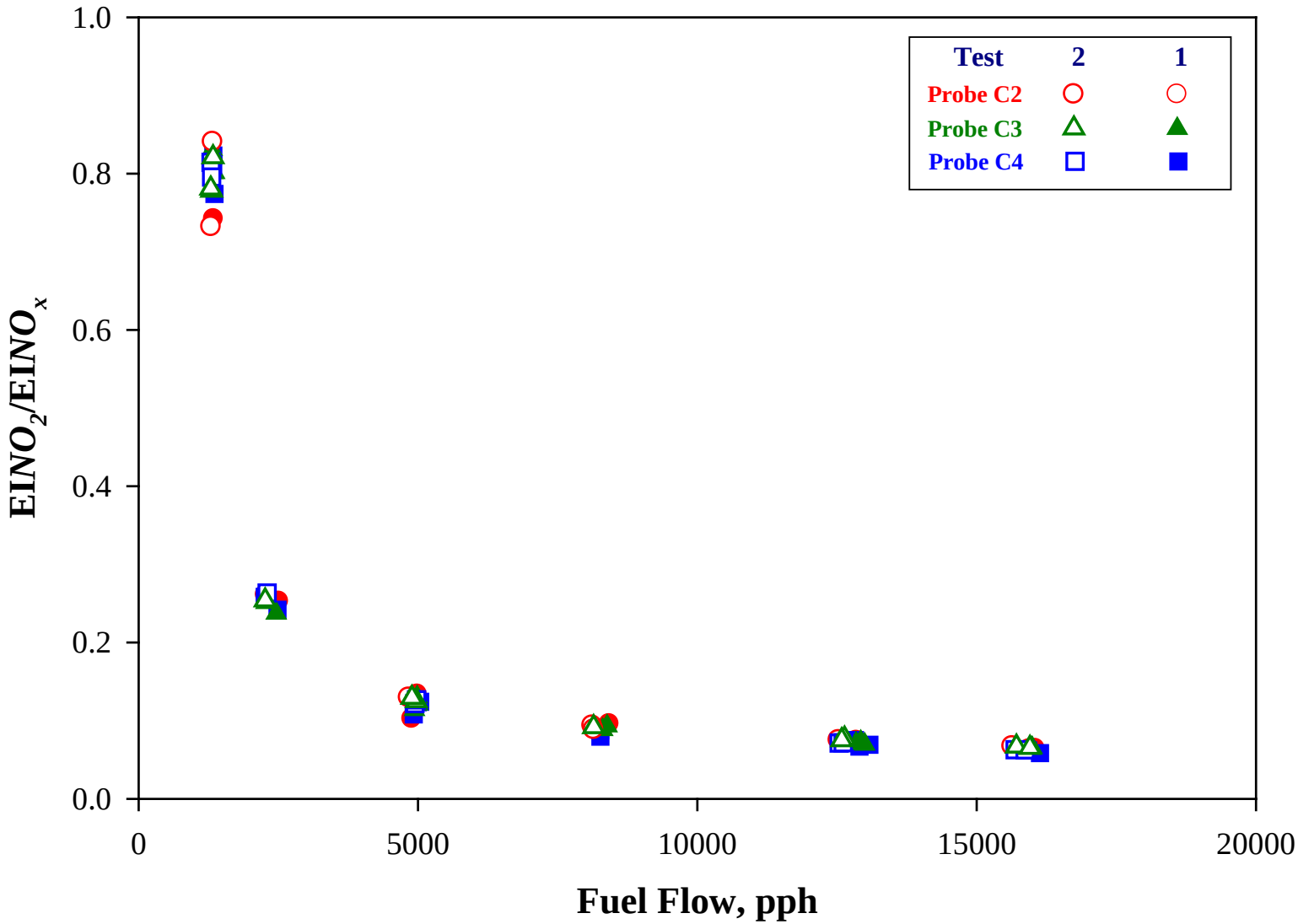
Airbus A300-600 (PW4158), EI*CO*



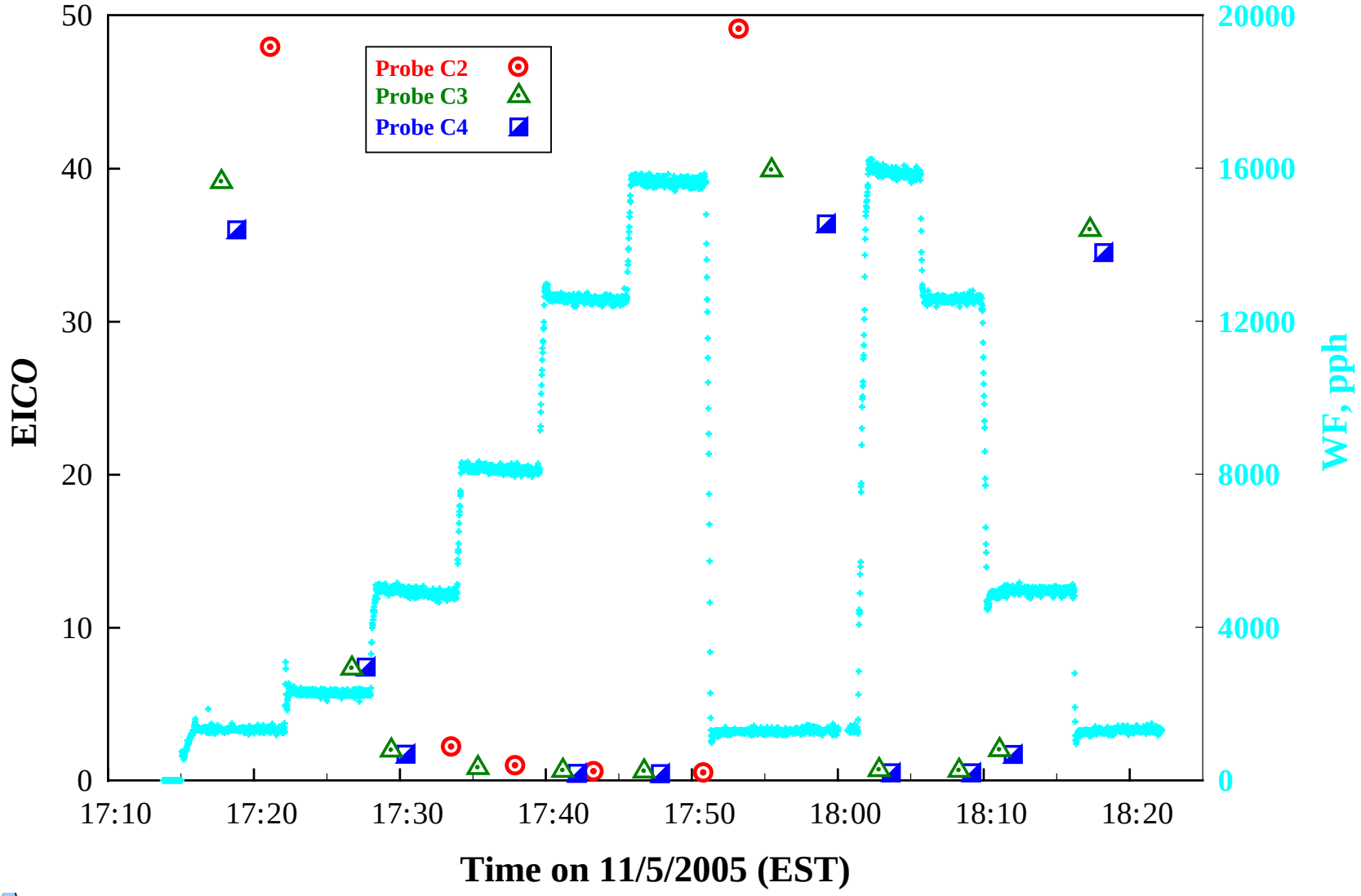
Airbus A300-600 (PW4158), EI*HC*



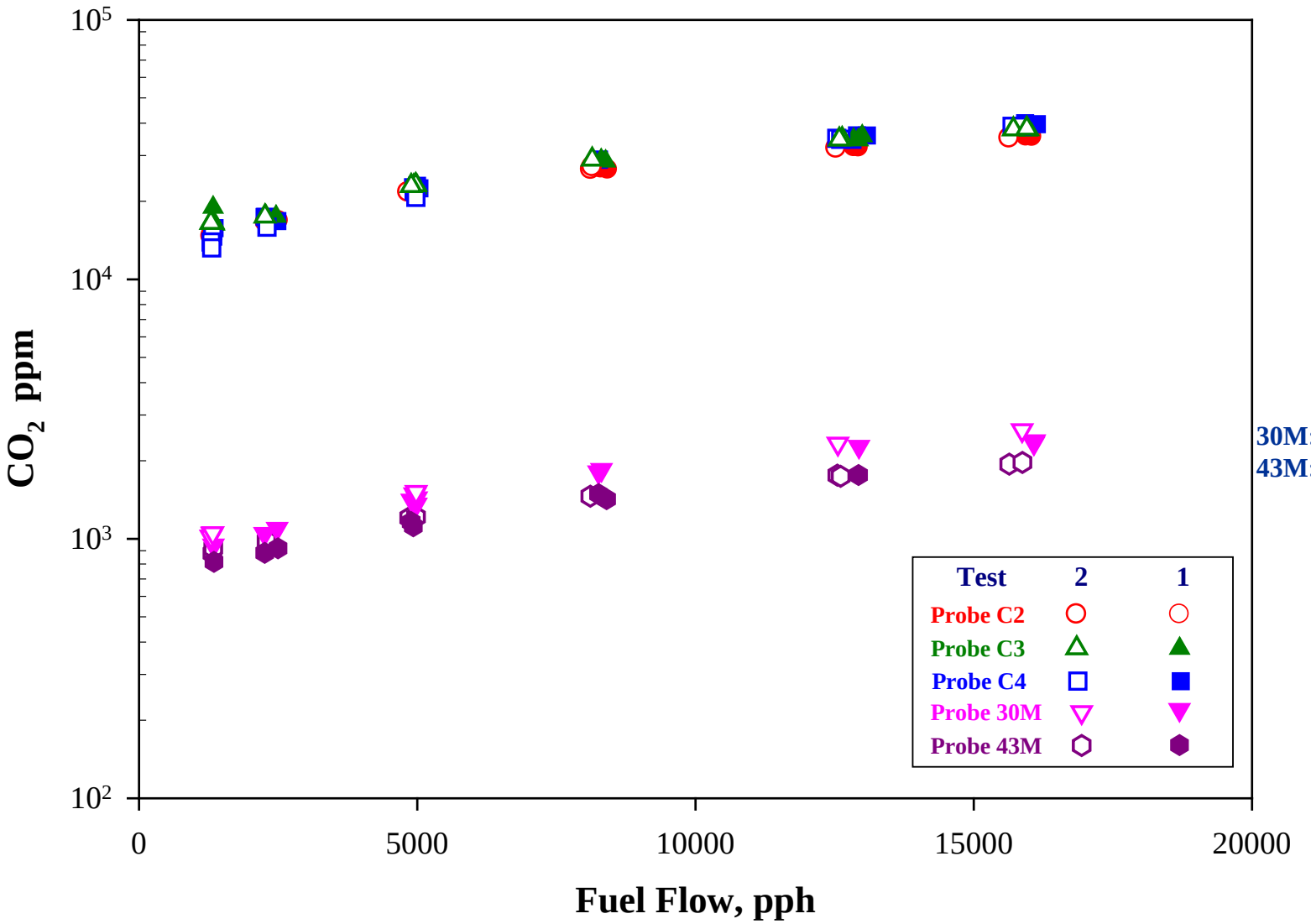
Airbus A300-600 (PW4158), $EINO_2/EINO_x$



Airbus A300-600 (PW4158), Time Series

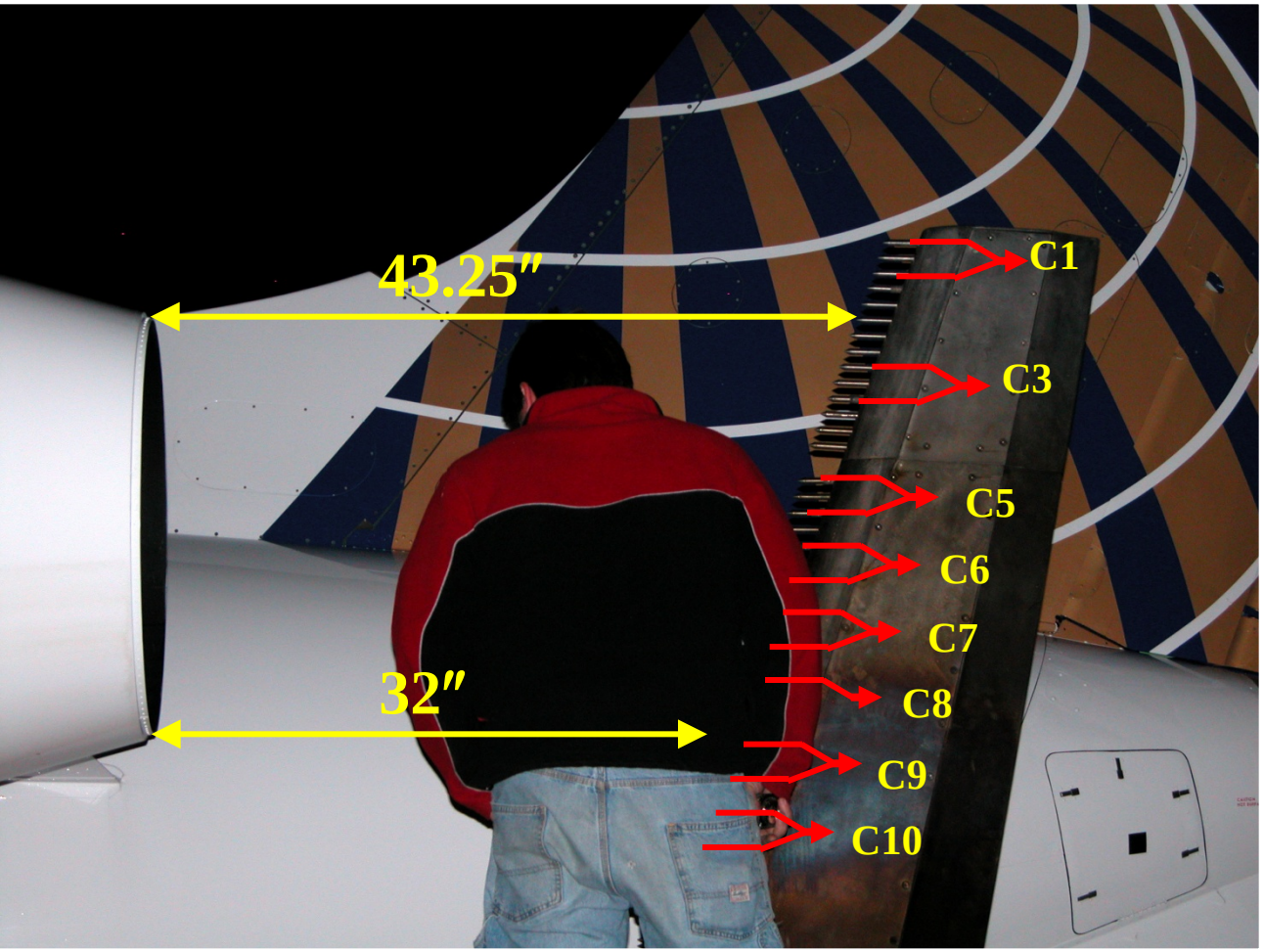


Airbus A300-600 (PW4158), CO_2 Comparisons

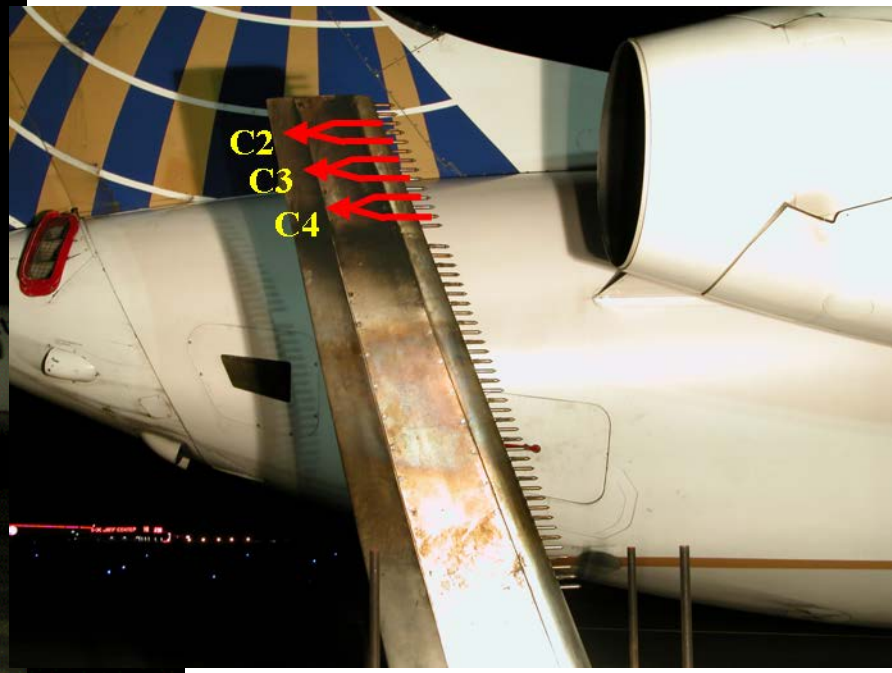


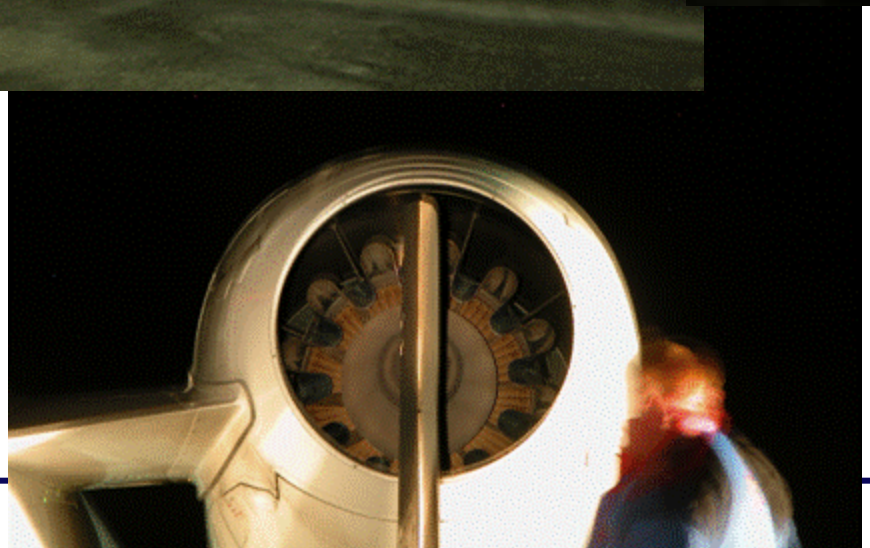
30M: 15.5±1.14
43M: 19.0±1.38

ERJ145 (AE3007-A1E) 11/3/2005

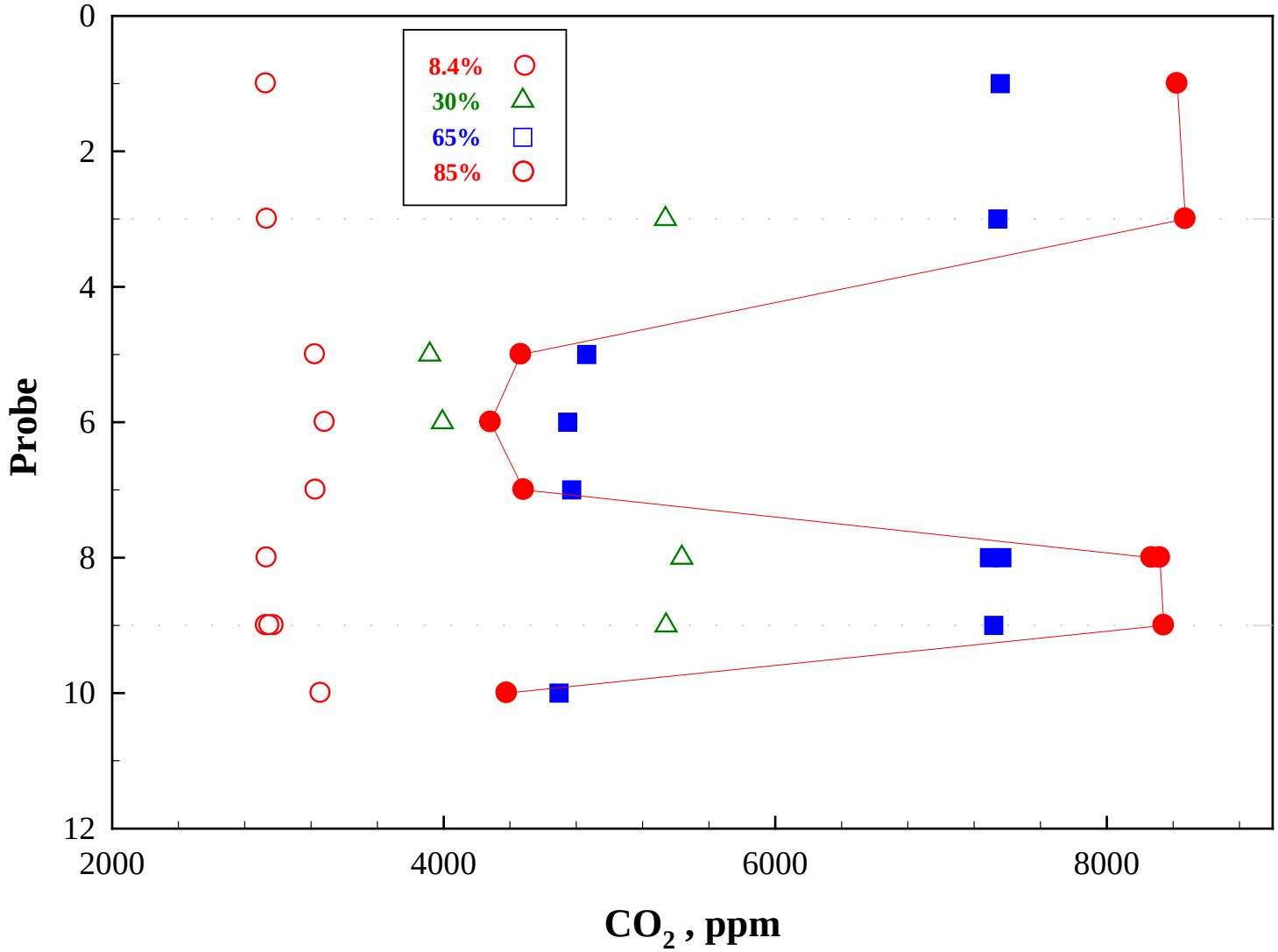


ERJ145 (AE3007-A1P) 11/7/2005

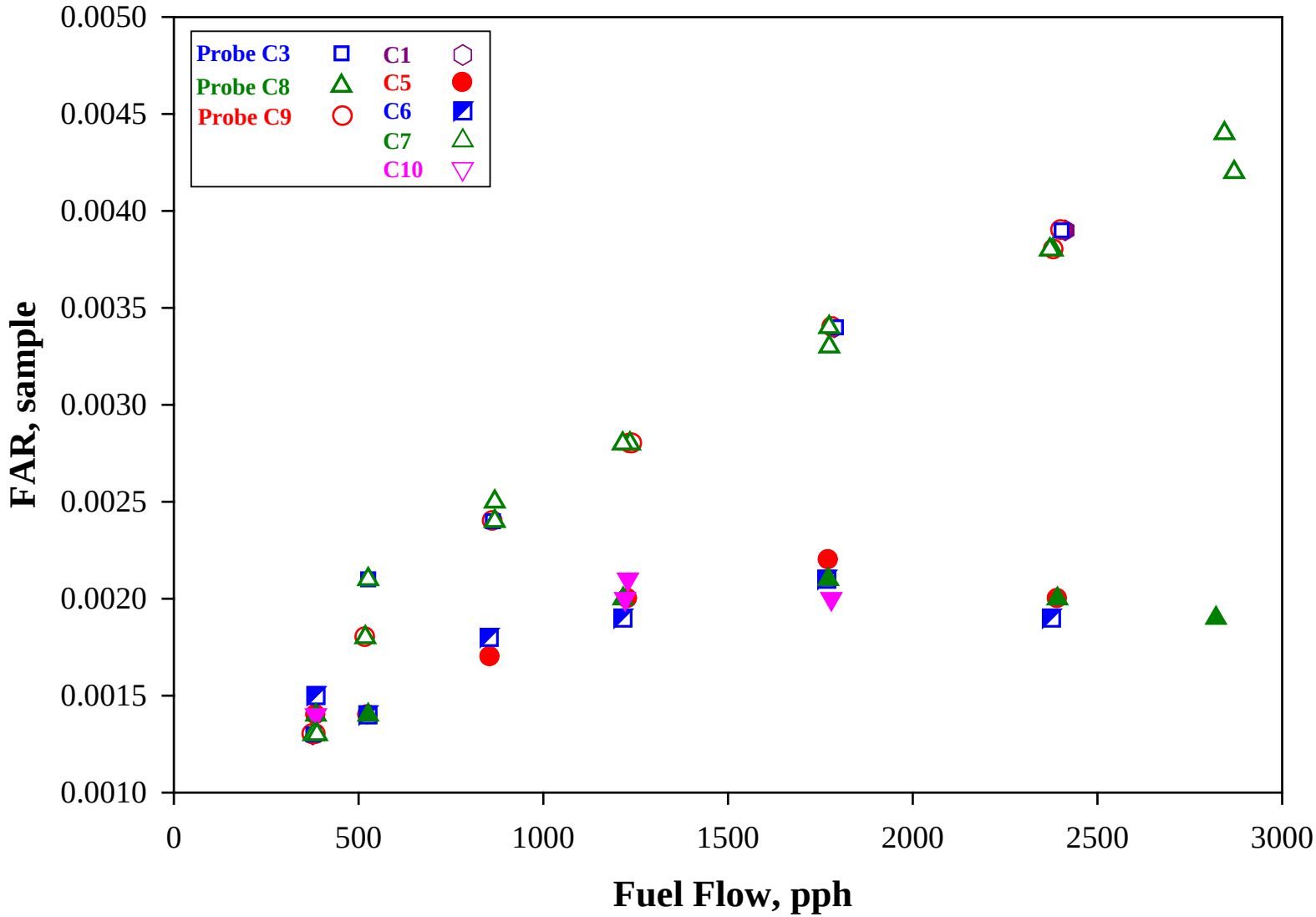




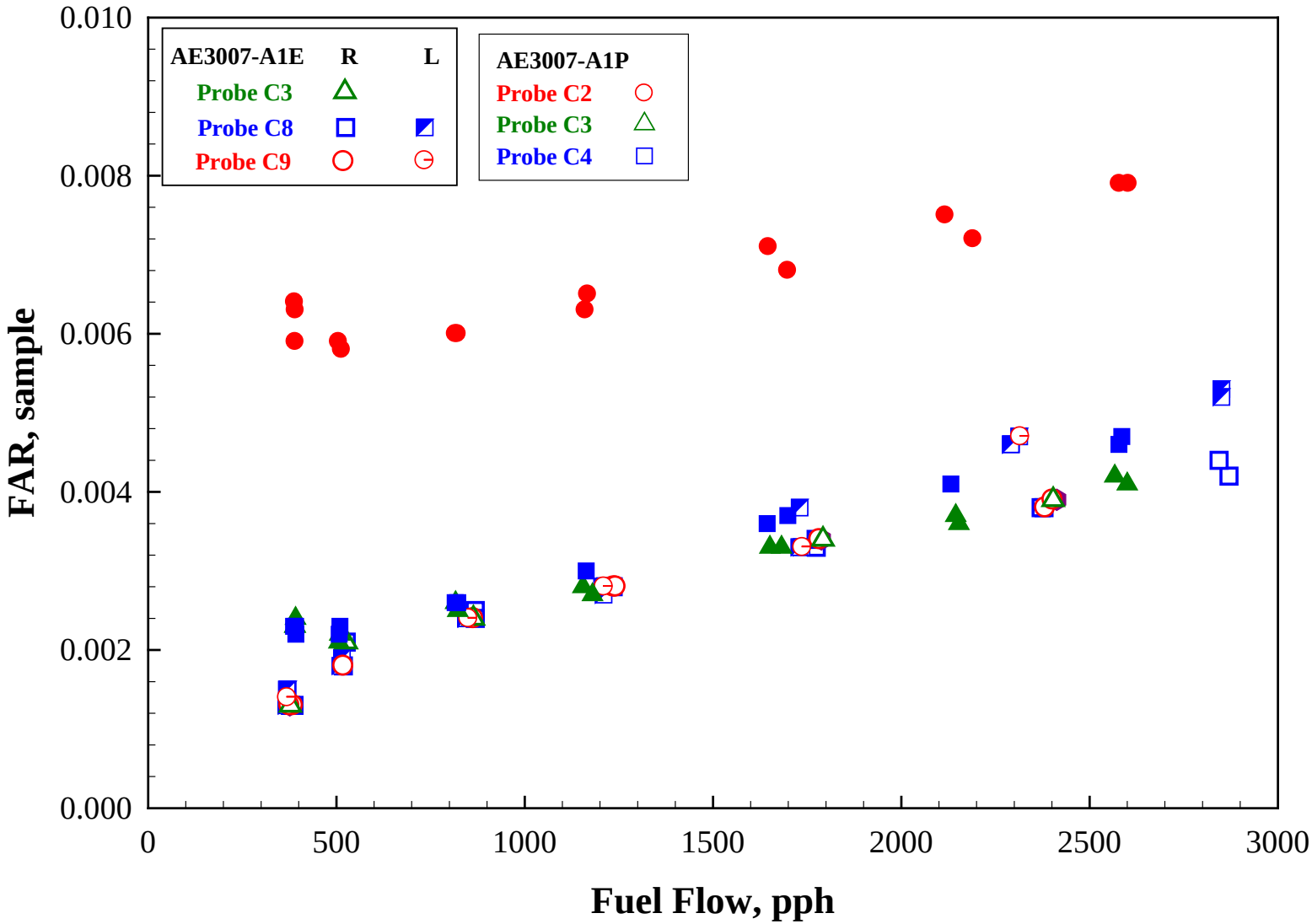
ERJ145 (AE3007-A1P), CO_2 Profiles



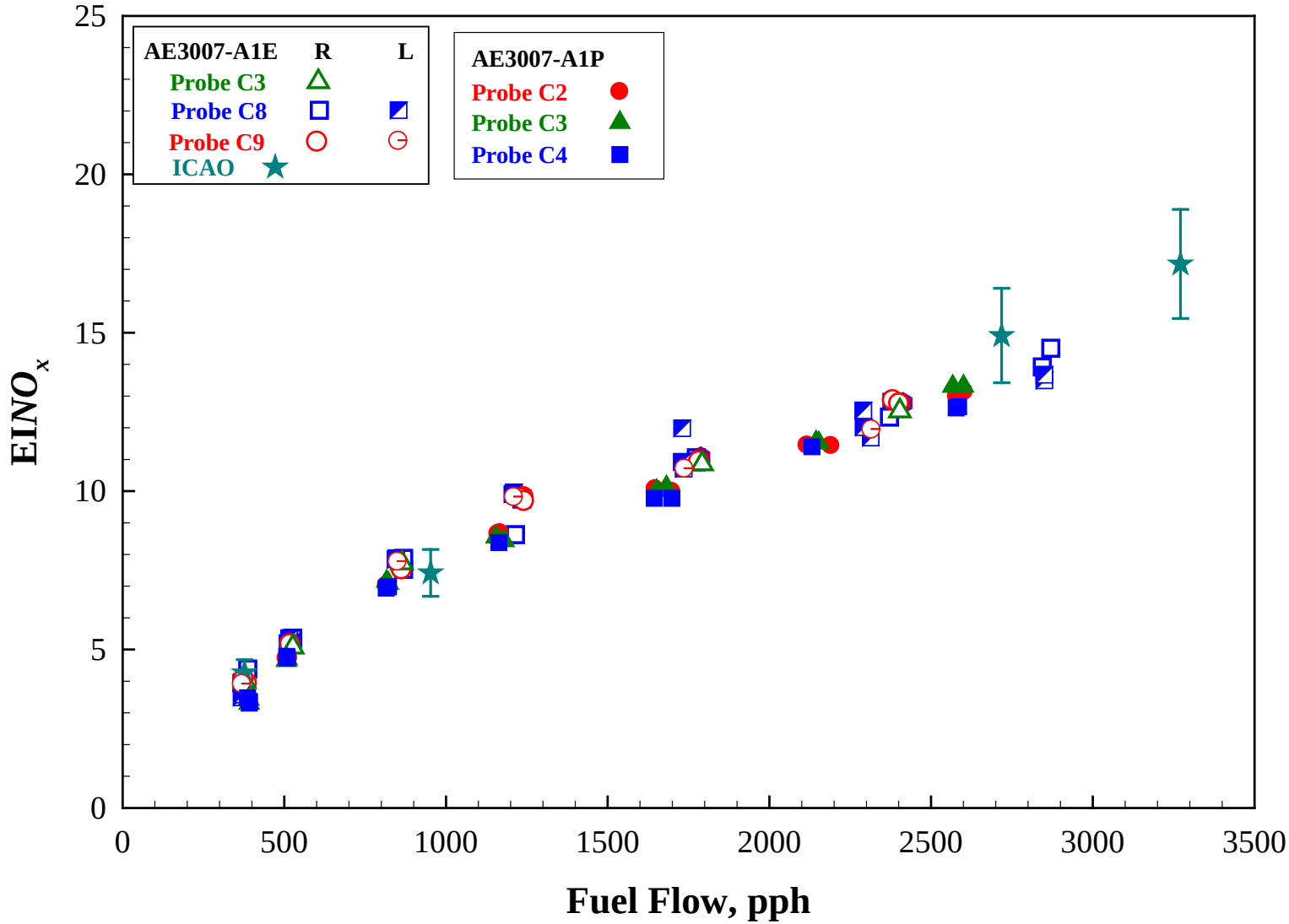
ERJ145 (AE3007-A1E, ESN:312846), FAR



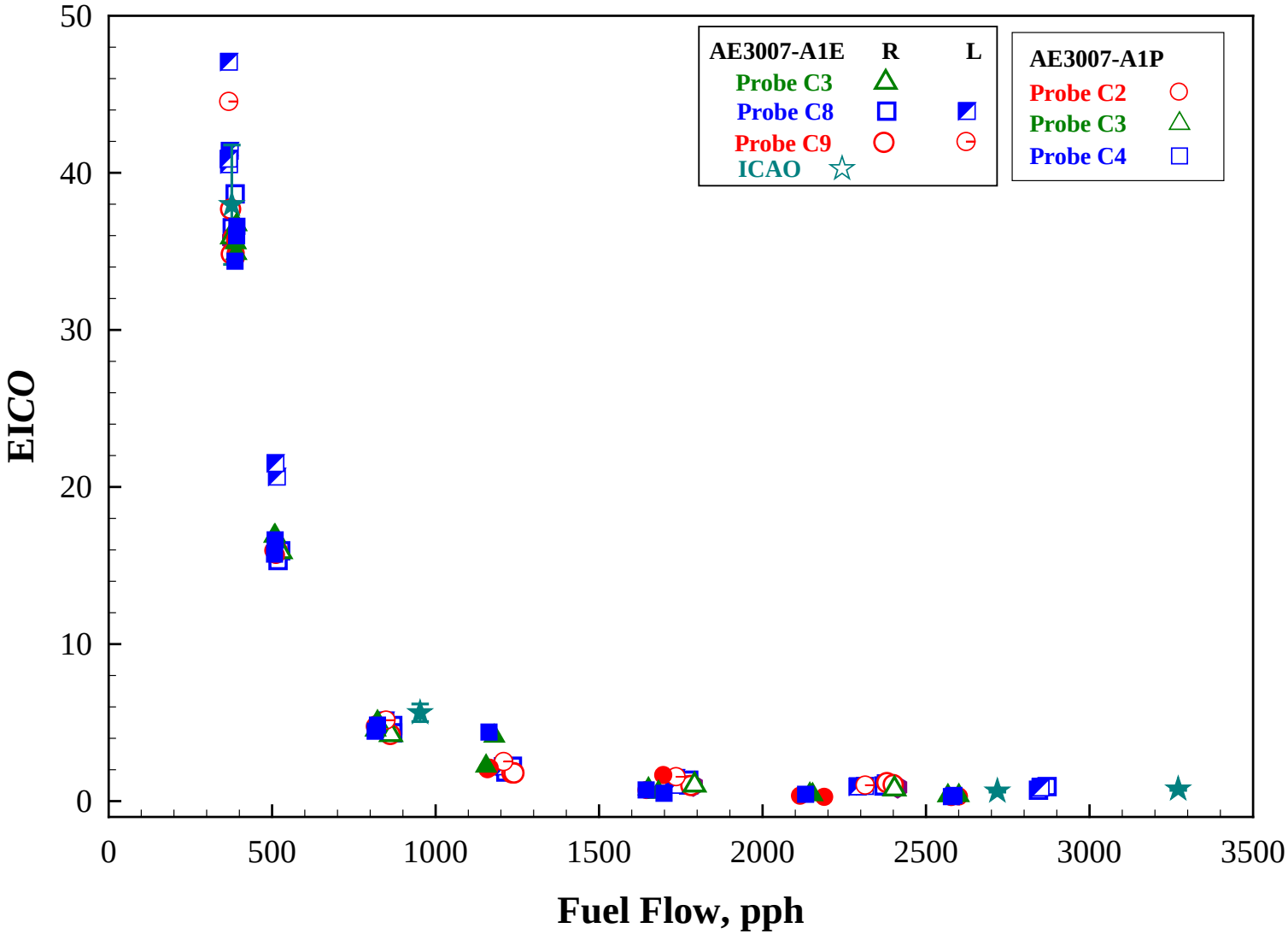
ERJ145 (AE3007-A1E & AE3007-A1P)



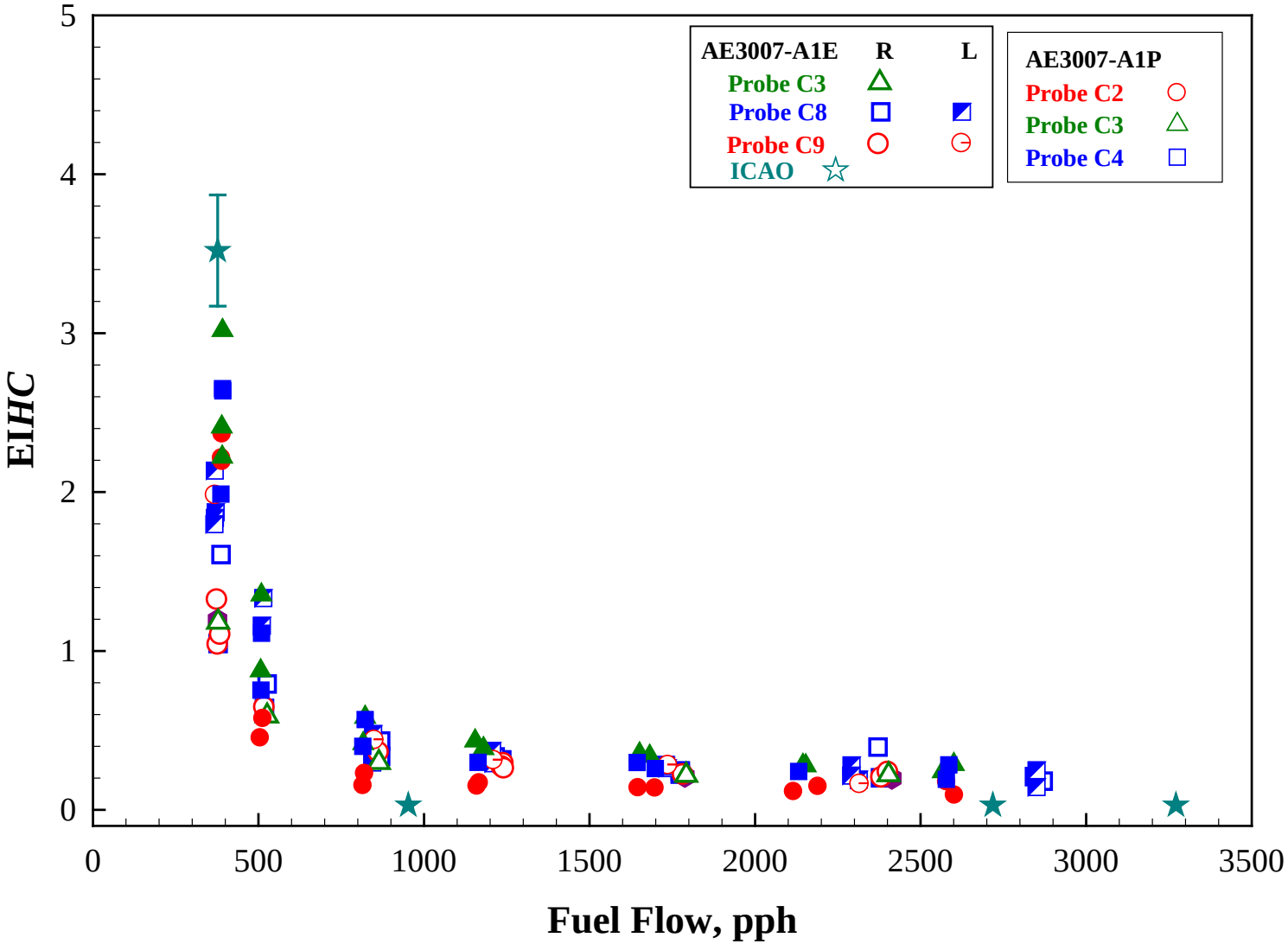
ERJ145 (AE3007-A1E & AE3007-A1P), EINO_x



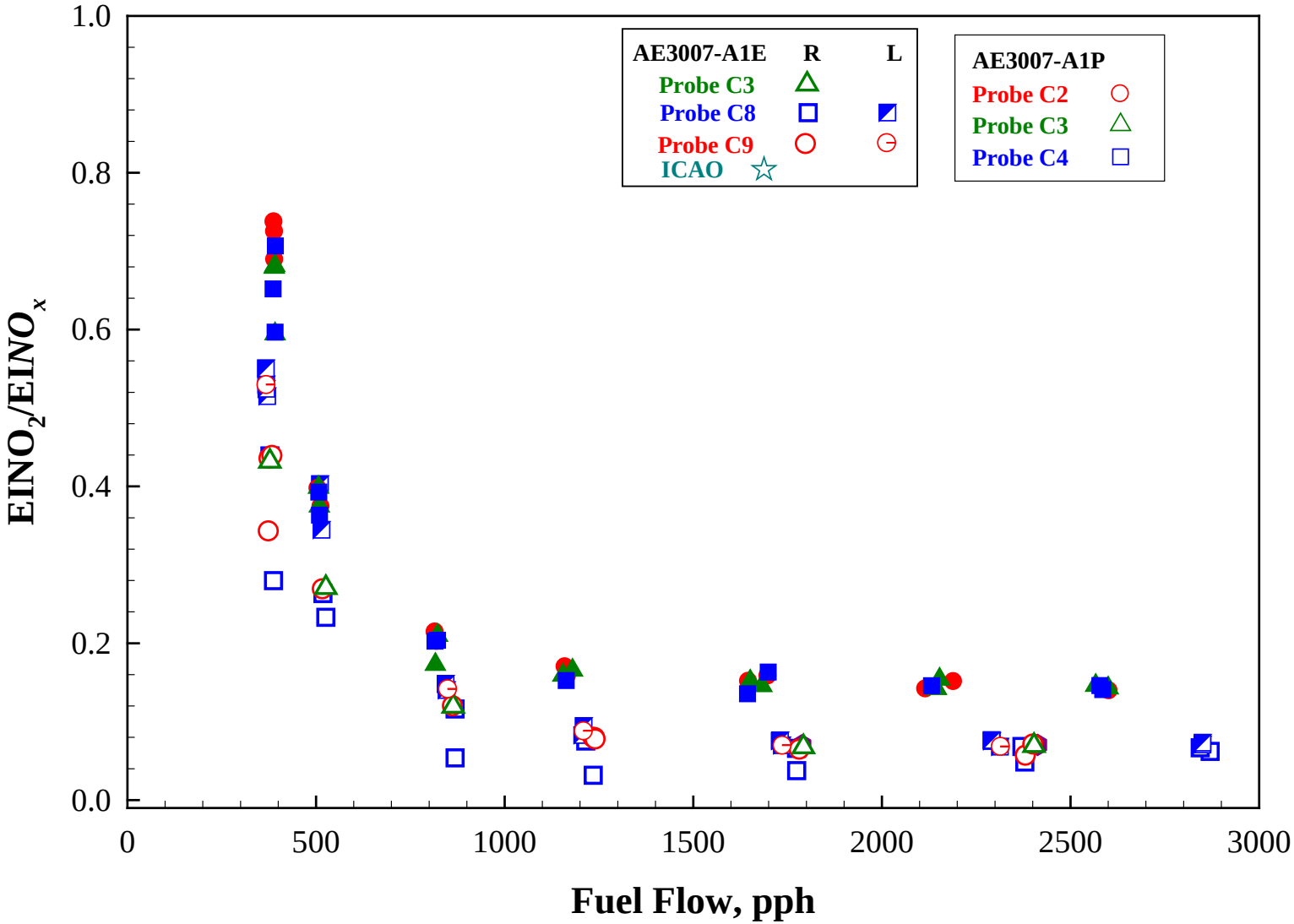
ERJ145 (AE3007-A1E & AE3007-A1P), EI*CO*



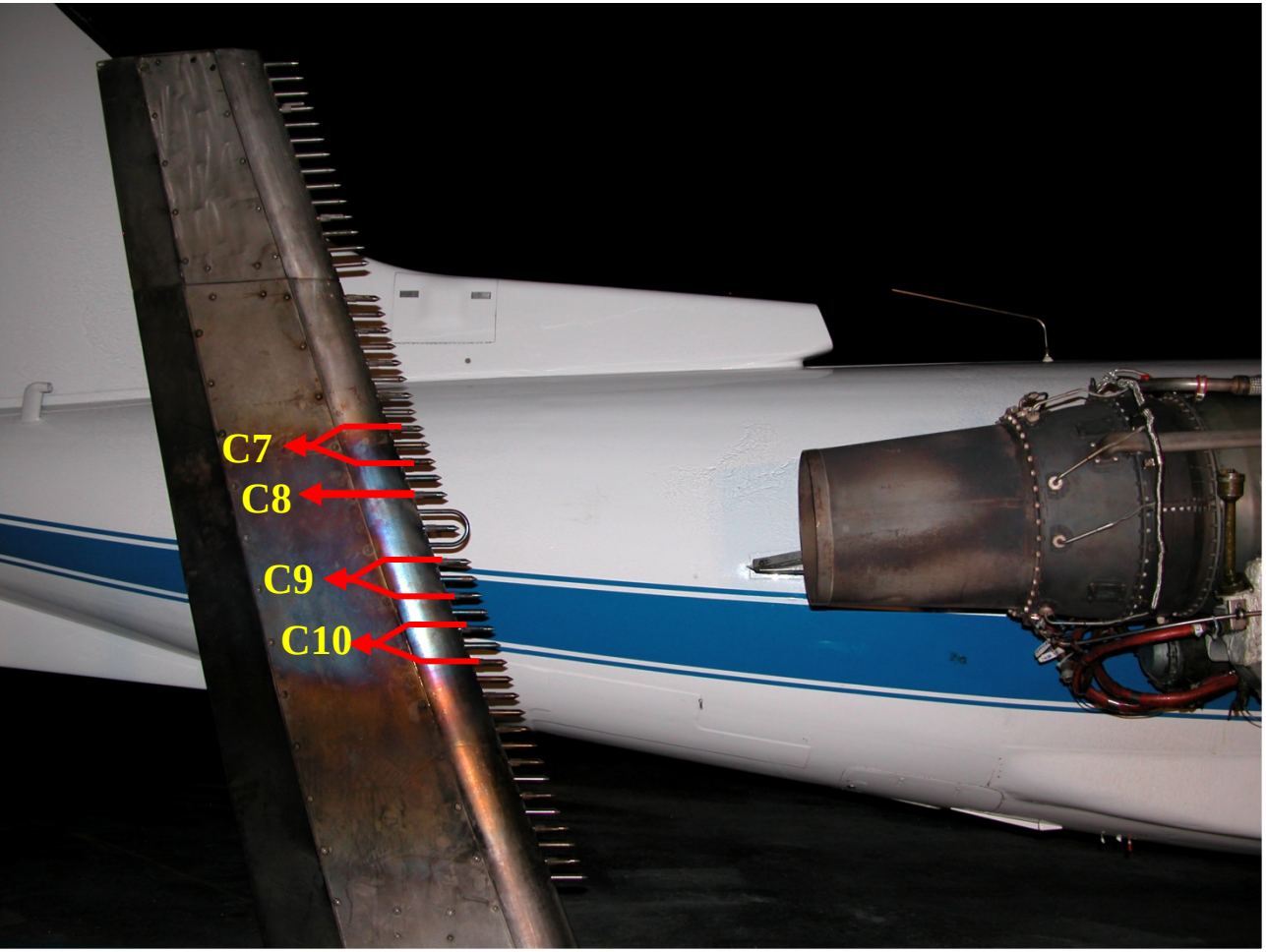
ERJ145 (AE3007-A1E & AE3007-A1P), EI*HC*



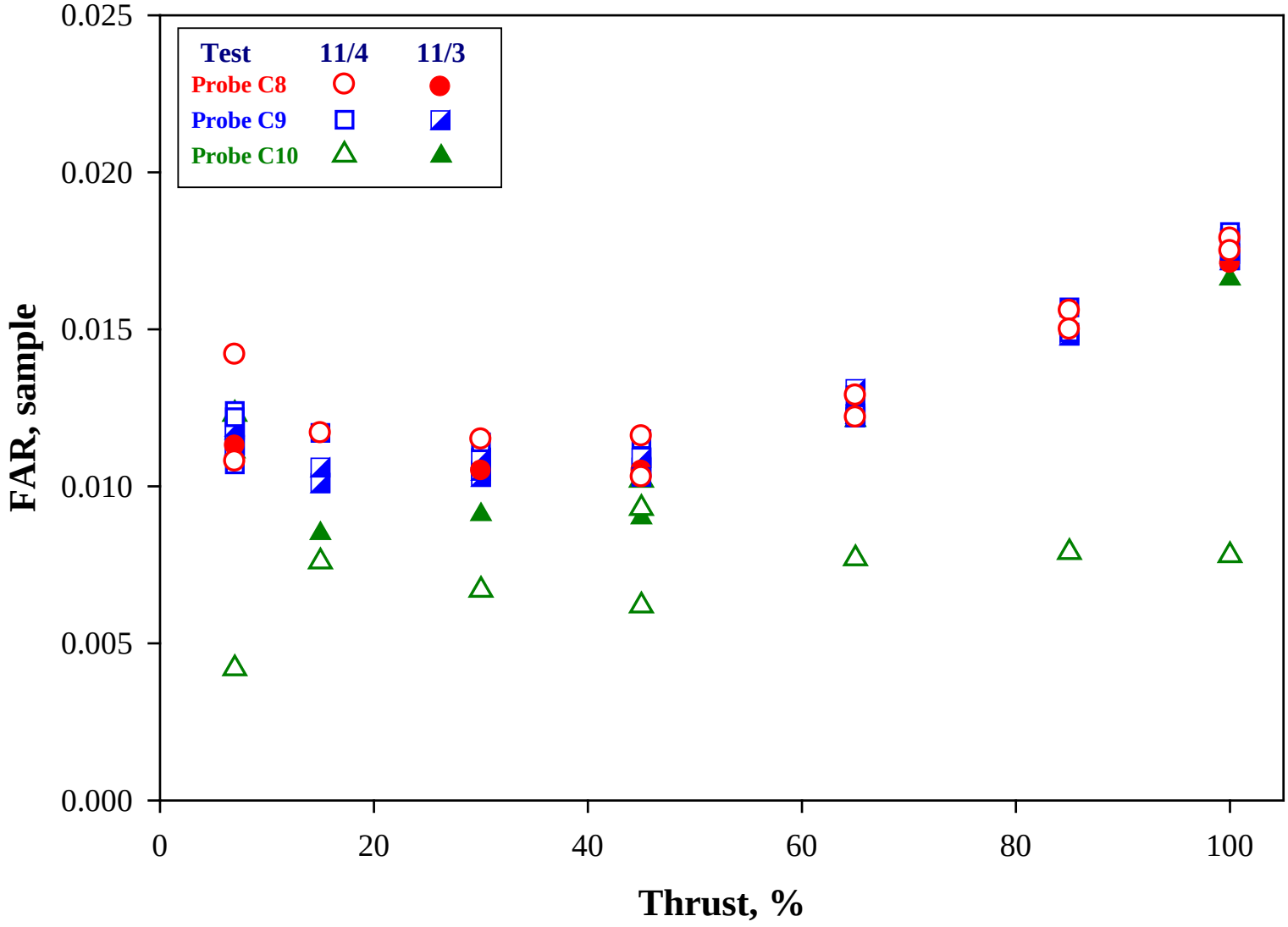
ERJ145 (AE3007-A1E & AE3007-A1P), EINO_2/EINO_x



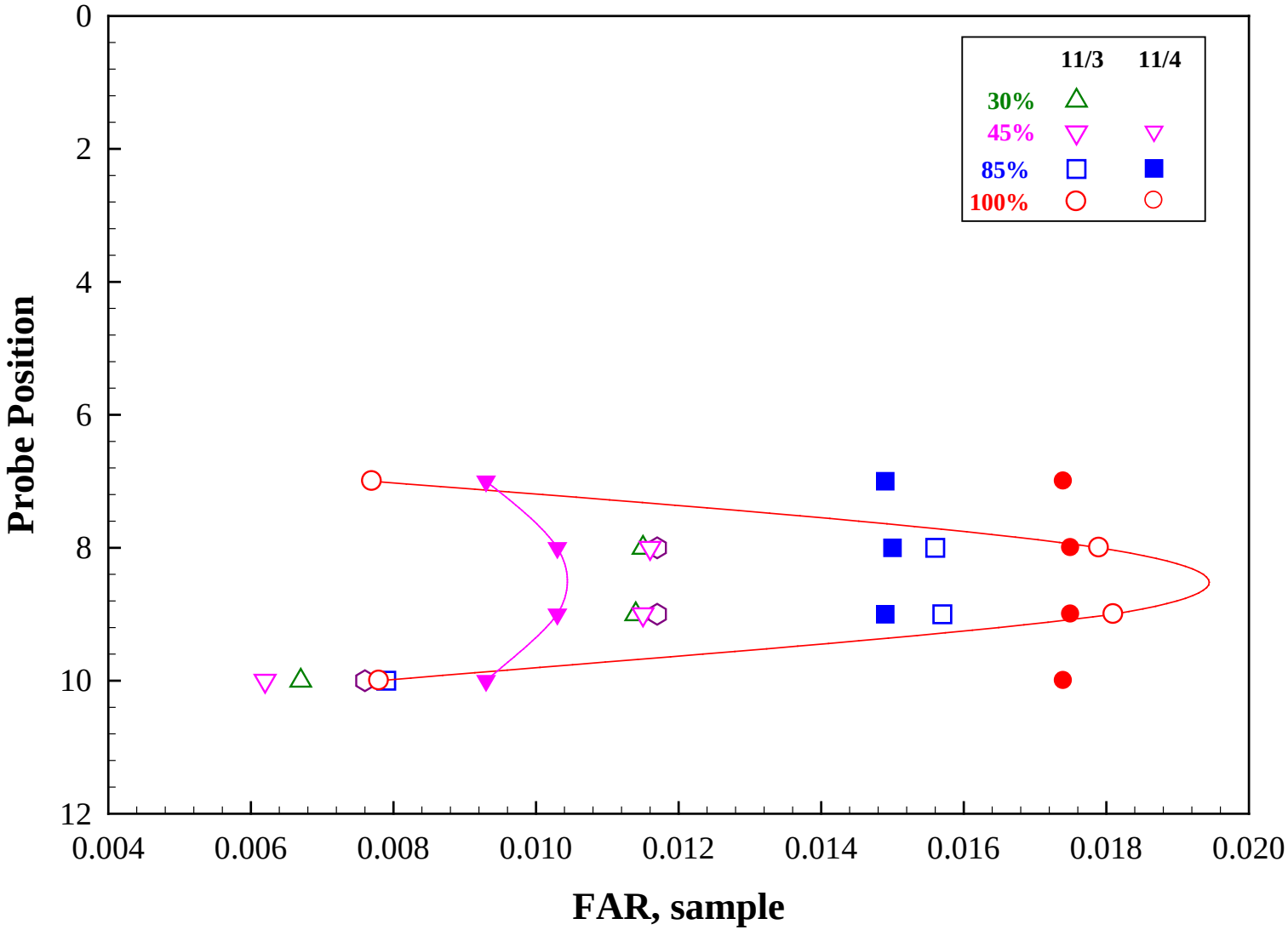
Learjet25 (CJ610) 11/3 & 11/4/2005



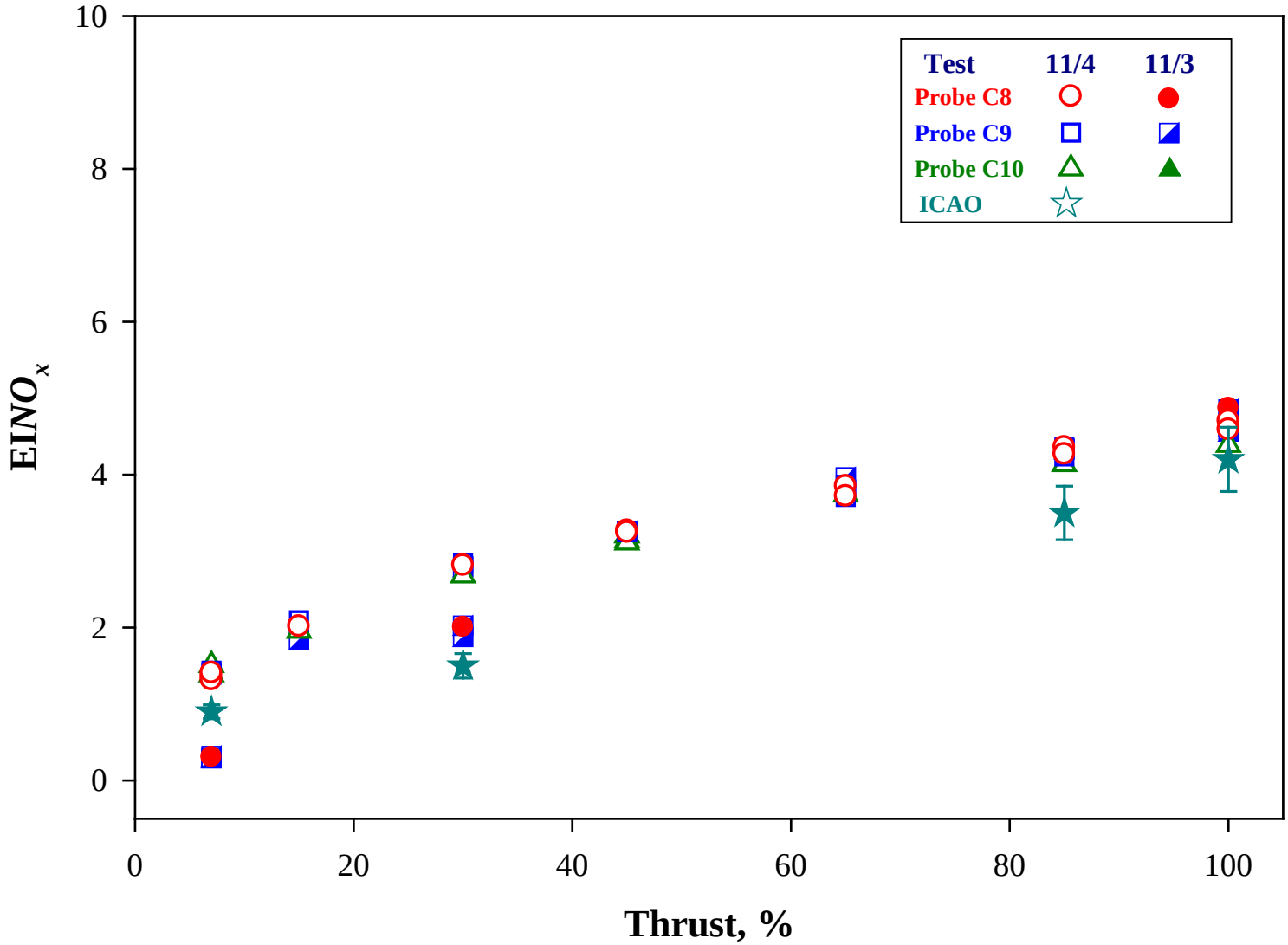
Learjet 25 (CJ610), FAR



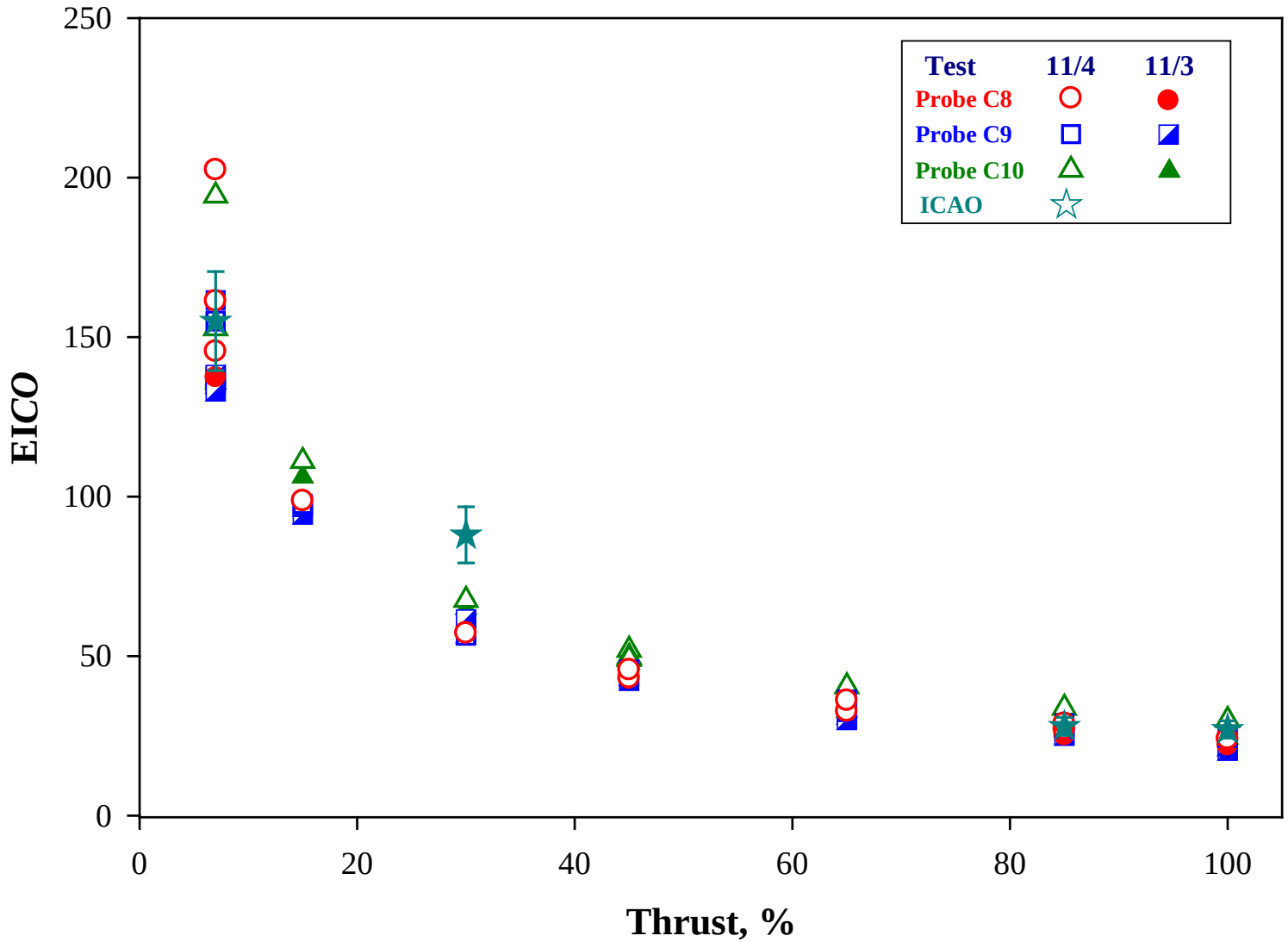
Learjet 25 (CJ610), FAR Profiles



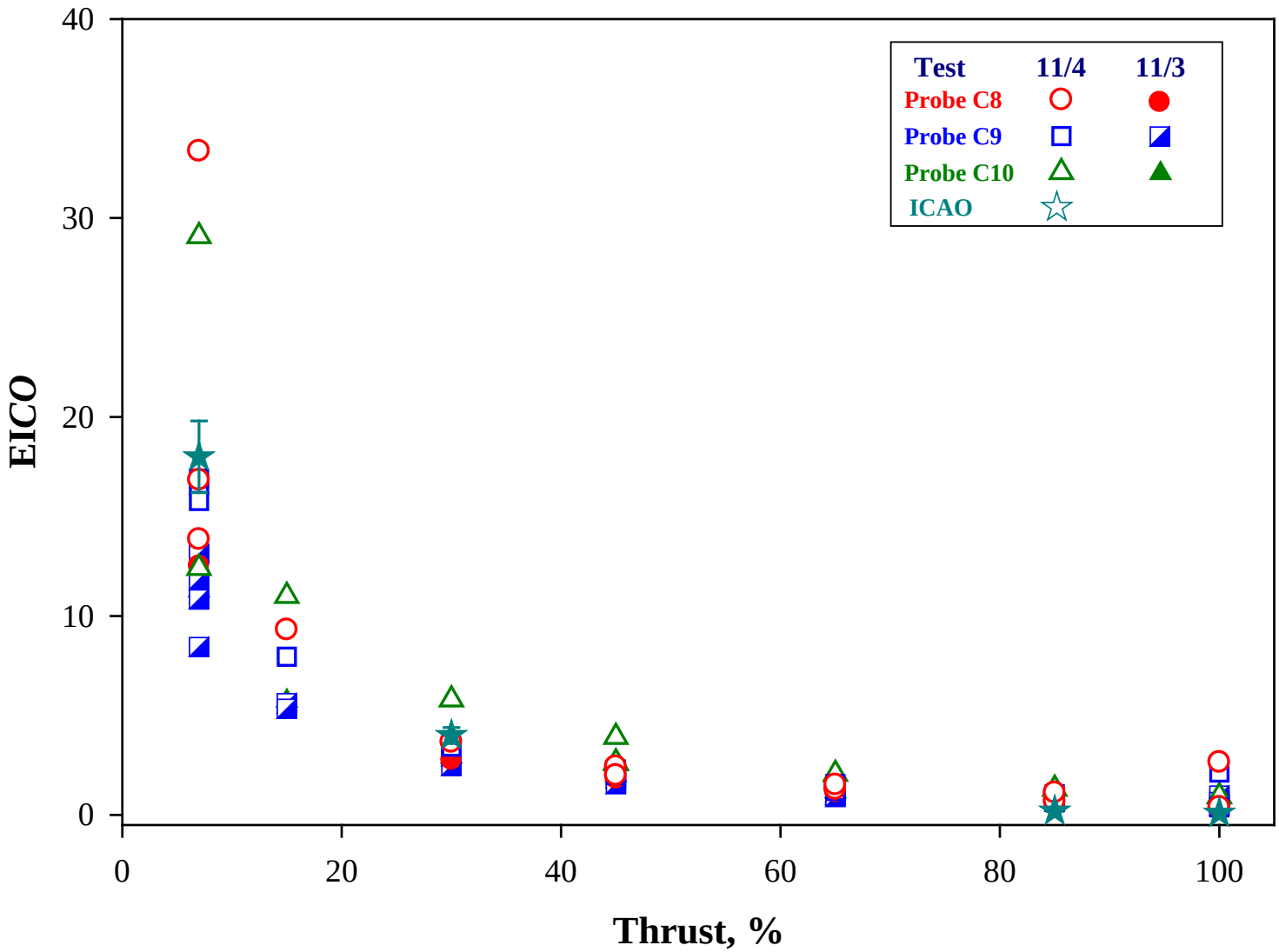
Learjet 25 (CJ610), EINO_x



Learjet 25 (CJ610), EI*CO*

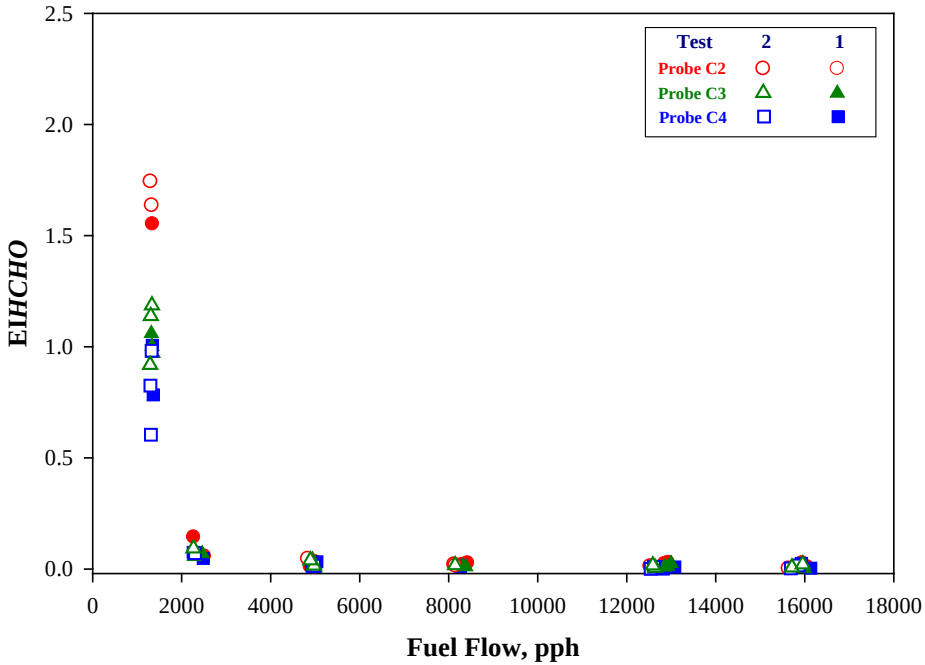


Learjet 25 (CJ610), EI*HC*

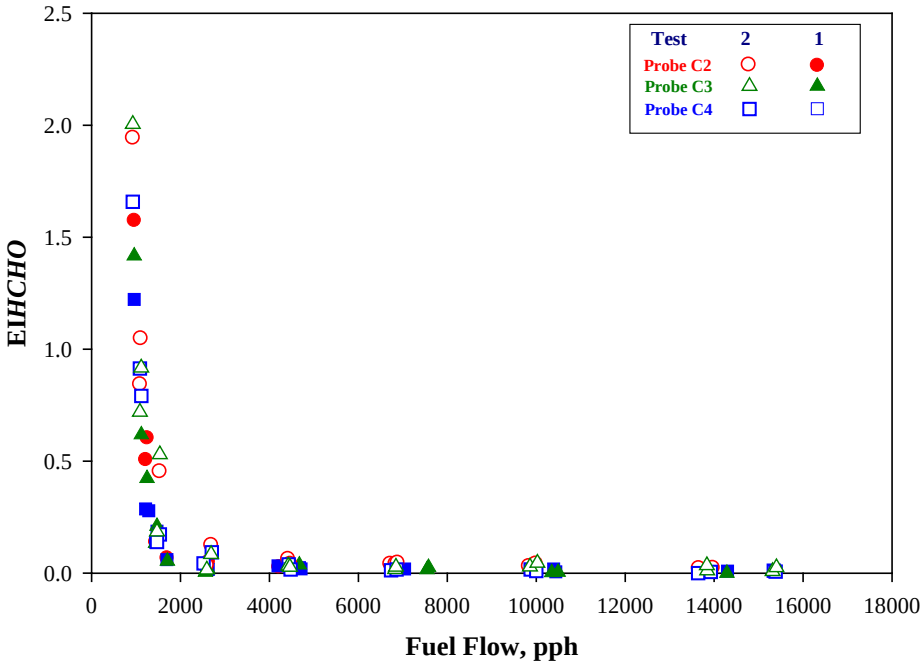


Emission Index of Formaldehyde

Airbus A300-600 (PW4158)

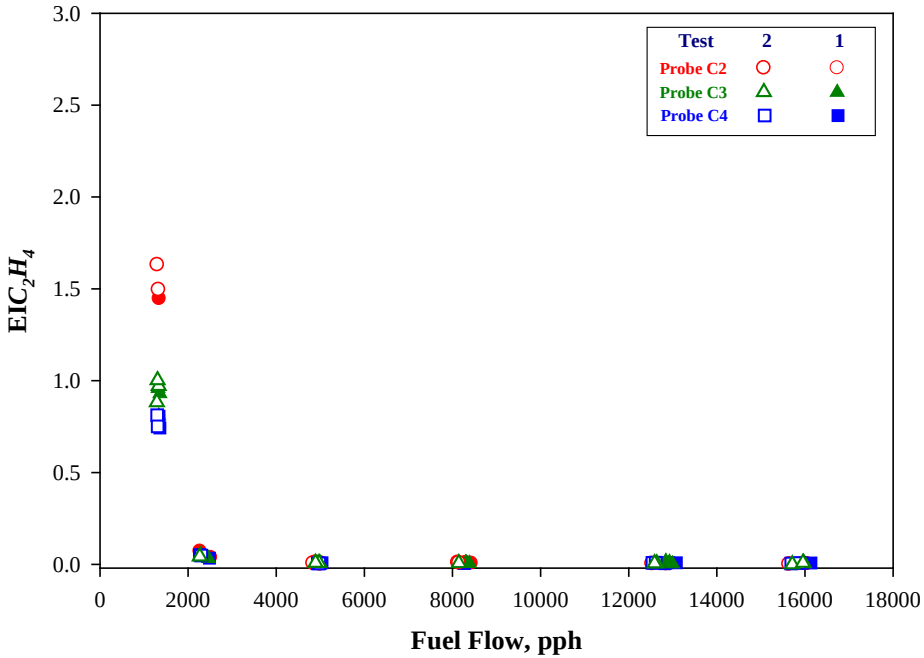


Boeing 757 (RB211-535E4B)

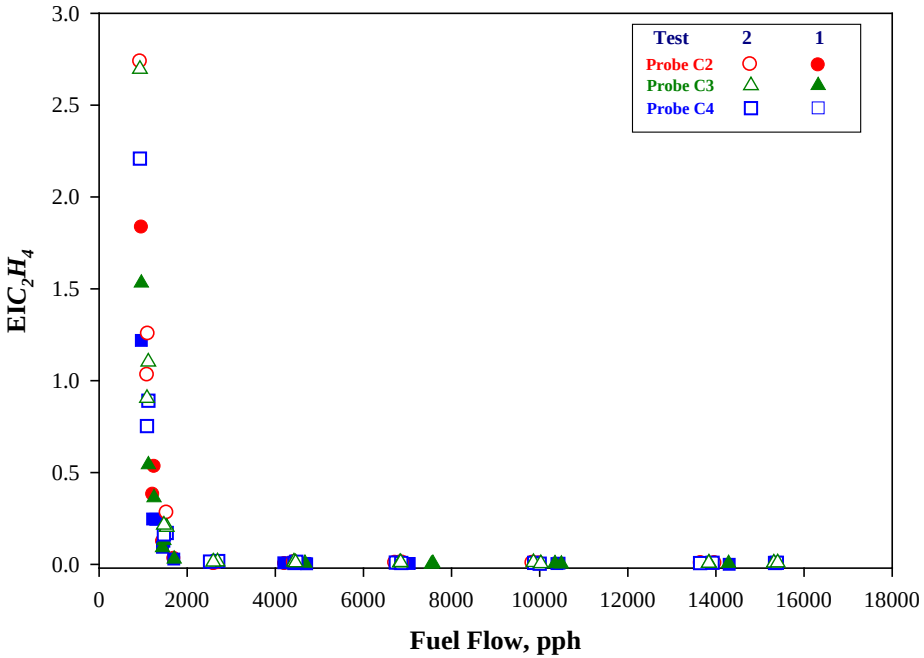


Emission Index of Ethylene

Airbus A300-600 (PW4158)

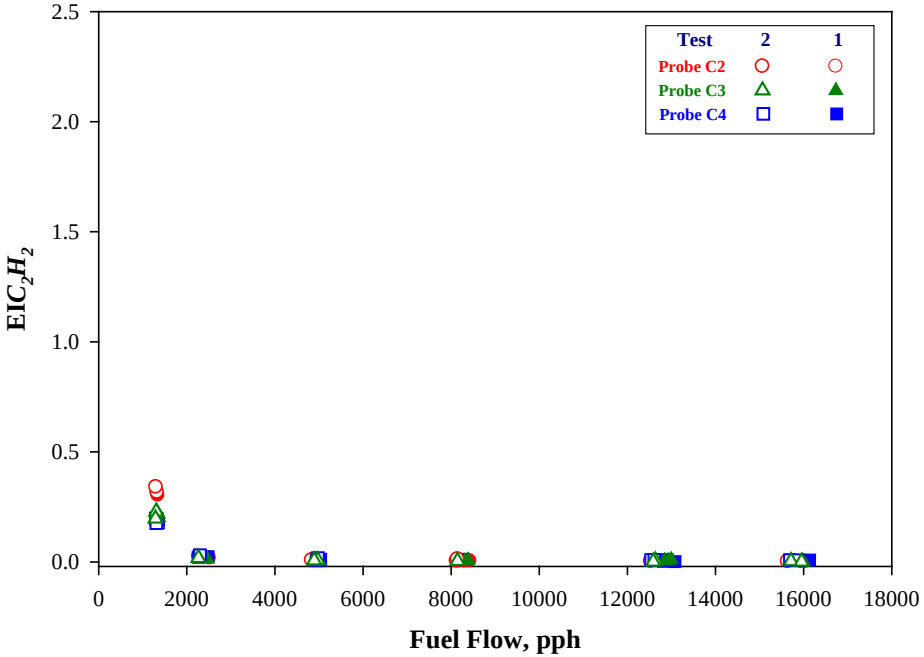


Boeing 757 (RB211-535E4B)

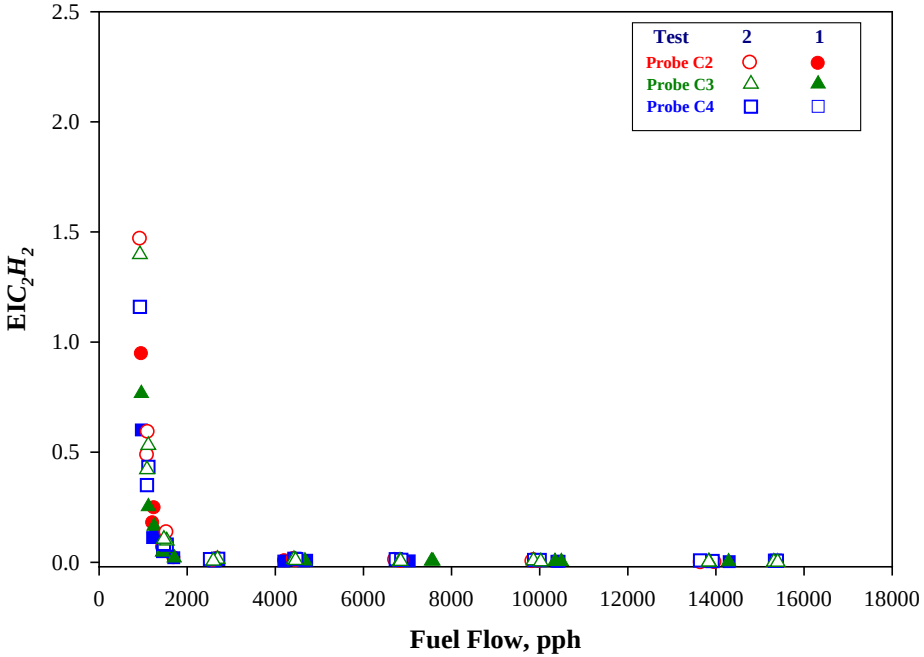


Emission Index of Acetylene

Airbus A300-600 (PW4158)

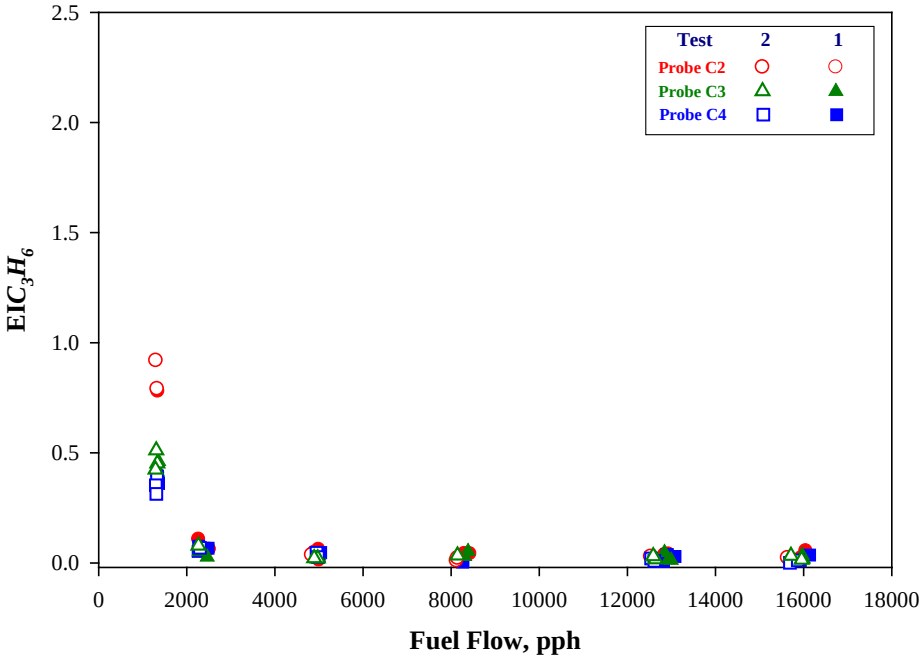
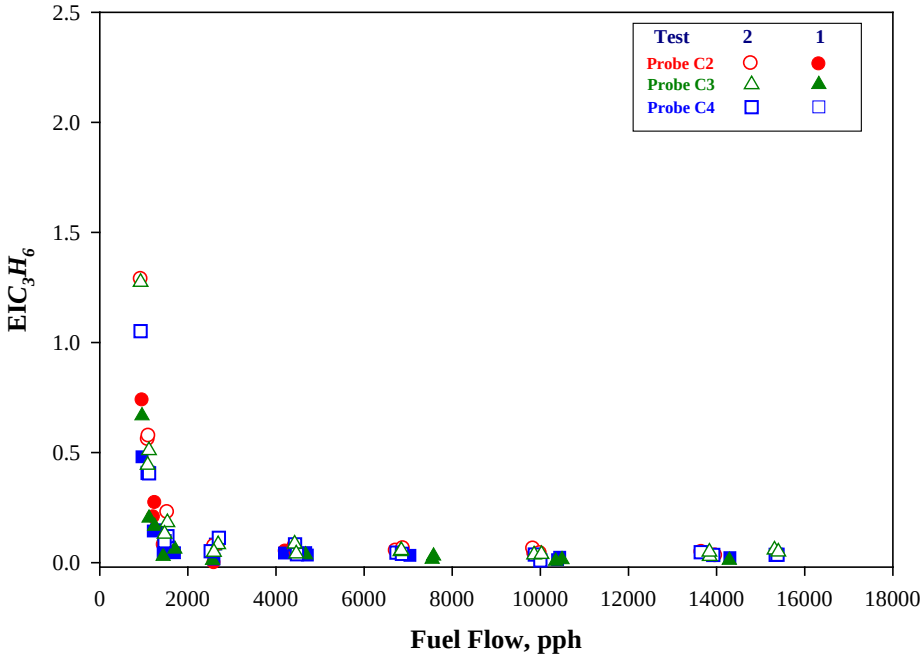


Boeing 757 (RB211-535E4B)



Emission Index of Propylene

Airbus A300-600 (PW4158)



Boeing 757 (RB211-535E4B)