Appendix D
Operational Evidence Regarding Crew Performance

Topic	Reference Event
A. Encounters with wake turbulence can surprise or startle flight crews,	(35) ASRS 269033 (April 1994) (61) ASRS 271187 (May 1994) (62) ASRS 279517 (August 1994) (63) ASRS 251874 (September 1994) (04) ASRS 280998 (August 1994) (64) ASRS 288796 (November 1994) (65) ASRS 190748 (October 1991) (66) ASRS 156250 (August 1990) (70) ASRS 145972 (May 1990) (71) ASRS 189664 (September 1991) (74) ASRS 299779 (March 1995) (75) ASRS 271385 (May 1994) (95) 737 Event (November 1995) (15) ASRS 280652 (August 1994) (67) ASRS 149927 (June 1990) (68) ASRS 256700 (November 1993) (69) ASRS 276427 (July 1994) (60) ASRS 293944 (January 1995) (05) 737 Event (June 1995) (55) 737 Event (June 1995) (56) 737 Event (June 1995) (57) 737 Event (June 1995) (09) ASRS 286702 (October 1994) (16) ASRS 49794 (January 1996) (10) ASRS 188899 (September 1991) (91) 737 Event (August 1995) (51) ASRS 314668 (August 1995) (11) ASRS 107506 (December 1988) (13) ASRS 298642 (February 1995) (72) ASRS 216232 (July 1992) (73) ASRS 285274 (October 1994) (12) ASRS 72048 (July 1987) (14) ASRS 213928 (June 1992) (54) 737 Event (October 1995) (94) 737 Event (November 1995)
B. Crews typically over-perceive the magnitude of unexpected rolls by a factor of two or three, and may react accordingly.	(32) CAA Air Traffic Control (Wake Vortex Reporting) (86) FAA Safety Analysis of Uncommanded Rolls (05) 737 Event (June 1995) (55) 737 Event (June 1995) (56) 737 Event (June 1995) (57) 737 Event (June 1995)

	(20) 737 Event (June 1995) (06) 737 Event (July 1995) (91) 737 Event (August 1995) (33) 737 Event (March 1995) (51) 737 Event (August 1995) (77) ASRS 260432 (January 1994) (95) 737 Event (November 1995) (24) 737 Event (October 1995) (45) 737 Event (September 1995) (46) 737 Event (February 1996) (52) 737 Events (September 1996) (58) 737 Event (April 1997)
C. Flight crews typically respond to unexpected upsets by immediately manipulating the flight controls. Both wheel and rudder control inputs are often used during the recovery.	(06) 737 Event (July 1995) (47) Ozark DC-9 (December 27, 1968) (03) ASRS 144064 (April 1990) (04) ASRS 280998 (August 1994) (20) 737 Event (January 1995) (48) 737 Event (February 1995) (42) ASRS 220642 (September 1992) (43) ASRS 225605 (October 1992) (44) ASRS 251615 (September 1993) (13) ASRS 298642 (February 1995) (64) ASRS 288796 (November 1994) (80) ASRS 92829 (August 1988) (79) ASRS 63448 (January 1987) (90) 737 Event (September 1995) (91) 737 Event (August 1995) (05) 737 Event (June 1995) (96) 737 Event (April 1993) (51) 737 Event (August 1995) (24) 737 Event (October 1995) (53) 737 Event (July 1995) (65) 737 Event (October 1991)
D. Flight crews have on occasion misapplied the rudder, used the wrong rudder altogether, or have failed to remove rudder inputs when they are no longer necessary,	(97) Donald Widman (I Learned About...Nightmare on Final) (02) United Airlines Engine Failure (27) United Airlines Advanced Maneuvers (single engine) (33) 737 Event (March 1995) (37) NTSB Aircraft Accident Report (03) ASRS 144064 (April 1990) (06) 737 Event (July 1995) (22) 737 Event (January 1979) (23) United Airlines Standards Captain L. S. Walters (34) Comfortable in the corners of the envelop (25) 737 Event (October 1986) (49) P. Fitts (Analysis of Factors Contributing to 460 Pilot-Error...) (96) 737 Event (April 1993)

	(59) 737 Event (April 1993) (29) 737 Sahara accident (March 8, 1994) (92) Airline training
E. There are occasions when crew members have independently commanded the controls. In some instances, one crew member has been unaware of the other crew member's rudder input.	(62) ASRS 279517 (August 1994) (79) ASRS 63448 (January 1987) (80) ASRS 92829 (August 1988) (12) ASRS 72048 (July 1987) (81) ASRS 276165 (July 1994) (33) 737 Event (March 1995) (05) 737 Event (June 1995) (97) 737 Event (June 1980)

(For further details, see Boeing's *USAir 427 Submissions Supplement: Human Factors,* Sep. 25, 1997.)