Selected Events Training Program

USAir Flight Training

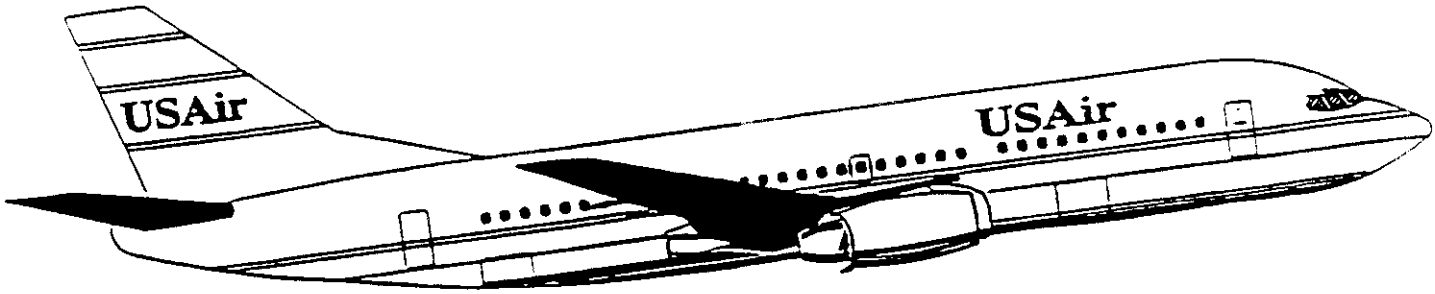
92-A

Wake Turbulence

- Rolling moment on the aircraft can be dramatic
- Resulting attitude may be nose low, with more than 90°s of bank
- RUDDER is an effective means of control
- Apply the appropriate unusual attitude recovery

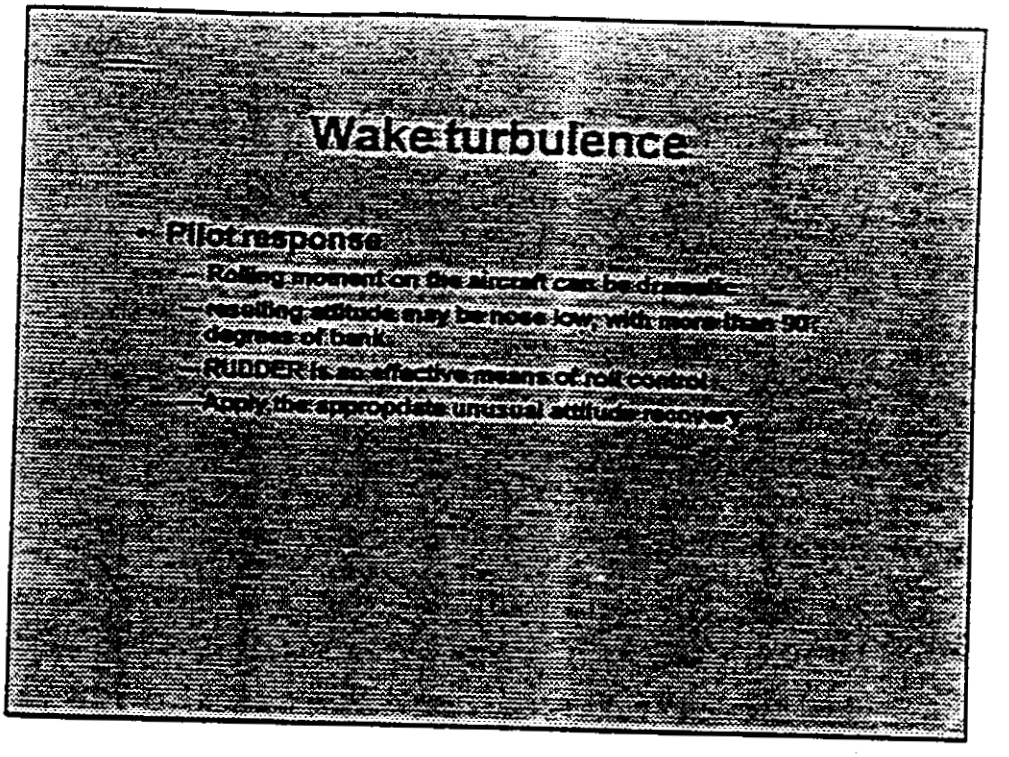
(92-A)

12-A



USAir Selected Events Training Program

(12-A)


Wake turbulence
Pilot response
Rolling moment on the aircraft can be dramatic
resulting attitude may be nose low, with more than 90 degrees of bank
RUDDER is an effective means of roll control
Apply the appropriate unusual attitude recovery

WAKE TURBULENCE

There are an increasing number of losses of control incidents worldwide associated with wake vortices encounters. Wing tip or wake vortices descend at approximately 300-500 feet per minute for about 30 second and then stabilize about 500-900 feet below the aircraft's flight path. Once they touch the ground they move laterally.

AVOIDANCE TACTICS

- Watch parallel runways less than 2500 feet apart. A better choice would be to take the upwind or same runway as the heavy you are behind. The downwind runway may have a wake vortex sitting over the runway a a low altitude.
- This is not strictly a light transport behind a heavy problem. Even the 747 has been known to scrape outboard engine pods dealing with wake turbulence.
- Landing behind a departing large aircraft - Plan on touchdown point before his rotation. Normally not a problem.
- Separation Criteria

  Takeoff - Small behind a Big 2 minutes or 5 miles

  Landing - Small behind a Big 5 miles

PILOT RESPONSE TO WAKE TURBULENCE

- Rolling moment on the aircraft can be dramatic
- Resulting attitude may be nose low, with more than 90 degrees of bank
- Apply the appropriate unusual attitude recovery
- Remember you are at high AOA and RUDDER is an effective means of roll control ←

MOUNTAIN WAVE ACTIVITY

Updrafts and lifting action generally exist on the windward side of a mountain range

Down-drafts, turbulence, and rotors usually exist on the leeward downwind side of a mountain range

PILOT TACTICS AND RESPONSES

- When possible favor the windward slopes
- Unusual attitudes and/or demands for maximum performance can rapidly evolve in mountainous terrain
- Escape maneuvers

AIRCREW/SYSTEM ANOMALIES

- Control Malfunctions
  - Rudder Hard-over
  - Slat Abnormalities
    - Approach/Low altitude
    - High altitude/ cruise
  - Flap Abnormalities
    - Asymmetry
    - Pilot misuse
  - Spoiler Float
  - Jammed Stabilizer

(92-A)

• AIRCREW / SYSTEM ANOMALIES	Slides #61-73 Video	:40

—Control Malfunctions (Slides #61-65)
—Western Airlines B-720
—China Eastern MD-11
—High Altitude Flight (Slides #66-68)
—Midwest Express Flt. 105
—Ground Proximity Warning System
(Slides #69-73)
—Automation and Complacency
—China Airlines B747 Flt. 006 (Video - 8 min.)
—Flying Tigers B-747 (Video - :15 min.)

• UNUSUAL ATTITUDE RECOVERY	Slides #74-86	:15
• ***BREAK***		:10
• USAIR'S SIMULATOR PROGRAM	Slides #87-97	:50

•USAir's Selected Events
(Slides #87-97)

• QUESTIONS AND ANSWERS		:15

TOTAL TIME 4:10

USAir SELECTED EVENTS TRAINING

SLIDE #	NARRATION	INSTRUCTOR NOTE
52	National Transportation Safety Board data show that between 1983 and 1993 there were at least 51 accidents and incidents in the United States that resulted from probable encounters with wake turbulence. In these 51 encounters, 27 occupants were killed, 8 were seriously injured, and 40 aircraft were substantially damaged or destroyed. (P)	
	--- SHOW WAKE TURBULENCE VIDEO ---	
53	The pilot response to a wake turbulence encounter should be: to use rudder as an effective roll control at approach speeds, and apply the appropriate unusual attitude recovery (S)	←
54	Mountain waves are present at several airports USAir serves. This activity involves winds moving up and down the mountain slopes. This creates several different types of turbulent situations for the flight crew. (P	

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USAir

Pilot Response

- Rolling moment on the aircraft can be dramatic
- Resulting attitude may be nose low, with more than 90° of bank
- RUDDER is ineffective means of control
- Apply the appropriate unusual attitude recovery

(1-B)

NON-TECHNICAL TRAINING

RECURRENT PILOTS ONLY CLASSES

• Introduction	0830-0840	:10
• Security - Intro To Terminology	0840-0855	:15
• Security - The Current Threat	0855-0910	:15
• Resource Management- Feedback	0910-0925	:15
• ***BREAK***	0925-0935	:10
• Security - The Common Strategy	0935-1005	:30
• Security - Review of Actual Incidents	1005-1035	:30
• Security - Security Requirements	1035-1105	:30
• ***BREAK***	1105-1115	:10
• First Aid	1115-1130	:15
• Decompression Training	1130-1200	:30
• Fires Training	1200-1215	:30
• ***LUNCH***	1215-1250	:30
• Water Ditching and Survival (v	1250-1315	:25
• General Ditching Procedures (s/t)	1315-1330	:15
• "A Strategy of Avoidance"(v)	1330-1350	:20
• PBE/Life Vests Training(μασκ σν)	1350-1405	:15
• ***BREAK***	1405-1415	:10
• "Windshear: What the Crew can do"(v)	1415-1427	:12
• General Windshear Questions(s/t)	1427-1437	:05
• General Subjects Questions (s/t)	1437-1450	:13
• Special Airports(ohp)	1450-1505	:10
• EMERGENCY EQUIPMENT(Board)	1505-1530	:25
• TCAS(v)	1530-1540	:10
• ***BREAK***	1540-1550	:10
• Low Visibility Training (s/t)	1550-1600	:10
• Selected Events Training *(s/t)	1600-1630	:30

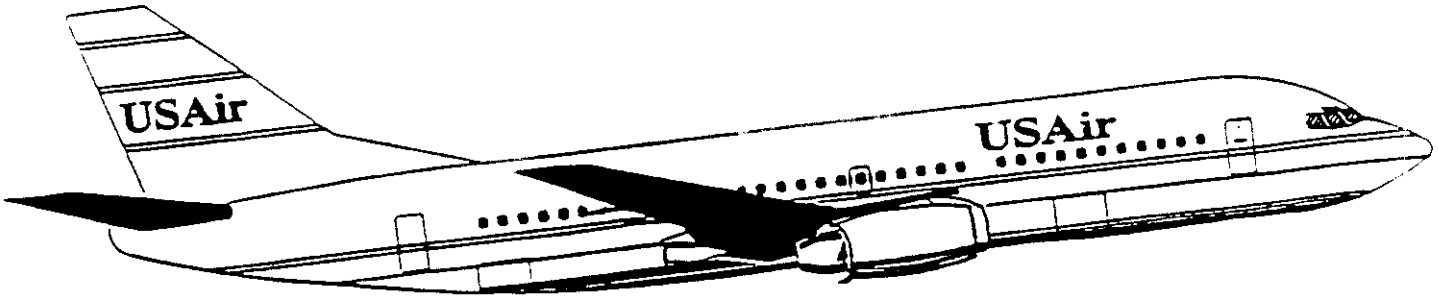
July 01, 1996

92-B

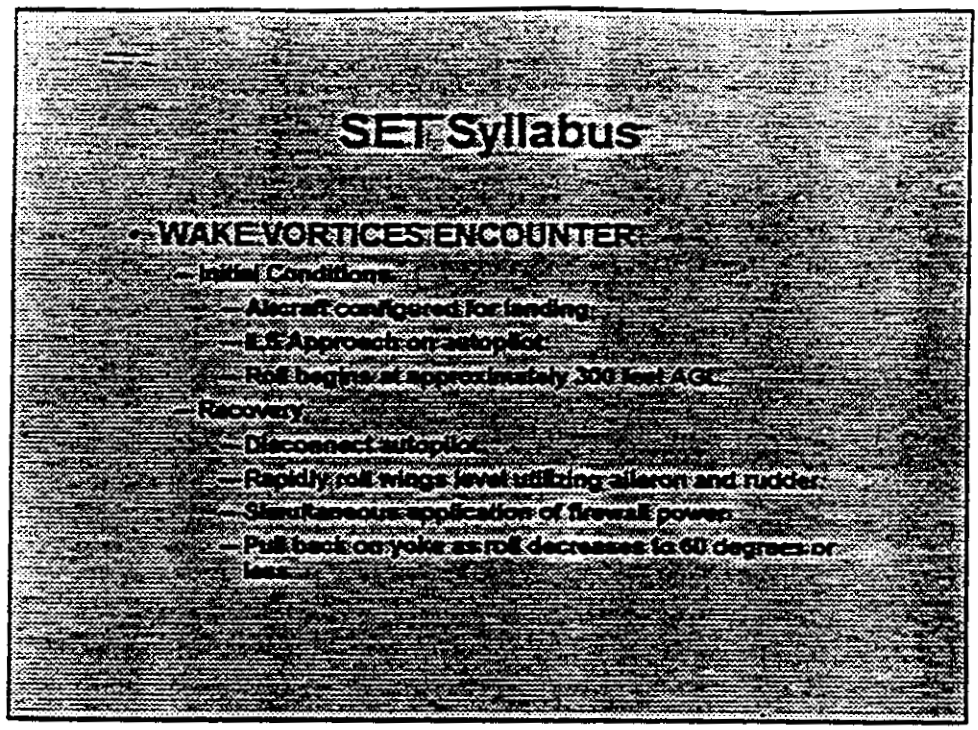
USAir SELECTED EVENTS TRAINING - RECURRENT

SLIDE #	NARRATION	INSTRUCTOR NOTE
23	The pilot response to a wake turbulence encounter should be to use rudder as an effective roll control at approach speeds, and apply the appropriate unusual attitude recovery (P)	←
24	Now let's discuss mountain wave activity The NTSB has speculated that the 1991 United Airlines Flt 585 accident in Colorado Springs was caused by flight into potential Rotor turbulence The investigation found the weather to be clear, temperature 49 degrees, dew-point 9 degrees, winds 330 degrees at 23 knots with gusts to 33 knots Clouds over the mountains to the north were spotted that afternoon Several PIREPS reported moderate to severe turbulence and mountain wave activity (P)	

92-5



USAir Selected Events Training Program


SET Syllabus
WAKE VORTICES ENCOUNTER
Initial Conditions
Aircraft configured for landing
ILS Approach on autopilot
Roll begins at approximately 300 feet AGL
Recovery
Disconnect autopilot
Rapidly roll wings level utilizing aileron and rudder
Simultaneous application of firewall power
Pull back on yoke as roll decreases to 60 degrees or

(92-B)

USAIR SELECTED EVENTS TRAINING INSTRUCTORS GUIDE

4. WAKE VORTICES

(92 C)

Initial Conditions	**ILS must be tuned prior to selection** Altitude 800 feet AGL Aircraft on Glideslope, on localizer Gear - down Flaps- Landing Autopilot - engaged Autothrottles (if installed) - engaged Speed - Final approach speed Simulator on **FREEZE**

Note: The initial conditions should automatically set the "CRASH OVERRIDE" control. Instructor should check to make sure this is engaged, i.e. that the simulator will freeze if the pilot hits the ground. This will prevent damage to the simulator visual.

ACTIVATE	Arm the scenario At 500 feet AGL the simulator will roll to 70 degrees in 1.5 to 2 seconds in whichever direction the simulator is banked at 500 feet AGL, simulating a wake vortices encounter

The instructor may FREEZE the simulator at this point, if desired, or allow the pilot to recover.

Briefing Items:

- The instructor should continue to emphasize smooth, positive application of flight controls
- The wake vortices maneuver builds on skills learned in the high AOA demonstration and nose low unusual attitude.
- The pilot should be reminded that the coordinated application of aileron and rudder can provide excellent roll response even at approach speeds to recover the aircraft to wings level attitude
- While a proficient pilot may recover quickly and continue the approach to landing, a more conservative approach would be to plan a go-around, since in a real world situation it would be difficult to determine if additional turbulence problems may be encountered.
- Remind the pilots that the normal configuration is autopilot engaged, and to disconnect the autopilot before initiating he recovery.

Desired Objectives.

- Disconnect autopilot prior to initiating recovery
- Apply coordinated use of both aileron and rudder to rapidly roll towards wings level.
- Apply go-around power (or firewall if required)
- Rotate toward the target go-around attitude

1/3/96

USAir SELECTED EVENTS TRAINING - RECURRENT

SLIDE #	NARRATION	INSTRUCTOR NOTE
29	Pilots of commercial aircraft must know the performance envelope in order to recognize and recover from high speed and low speed buffet situations. Recovery at high altitudes must include speed reduction combined with small slow, smooth control inputs. (P)	
30	Loss of an engine at or near V-1 has been part of our pilot training programs since the development of multi-engine aircraft. However, there have been several accidents attributed to an engine out in the altitude range of 500 feet to 1000 feet, after gear retraction prior to reaching clean maneuvering speed. Low airspeed/high drag problems can also be encountered on approach as well as takeoff. Pilots should understand recovery techniques for both autopilot engaged and hand flying. Recovery should be in 3 steps. 1 Maintain wings level with aileron.. 2 Push rudder on the side of the lower yoke or (step on the ball). 3 Our biggest problem has been stepping on the wrong rudder!! (P)	←

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