



National Transportation Safety Board



Human Performance

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See-and-Avoid Traffic Separation

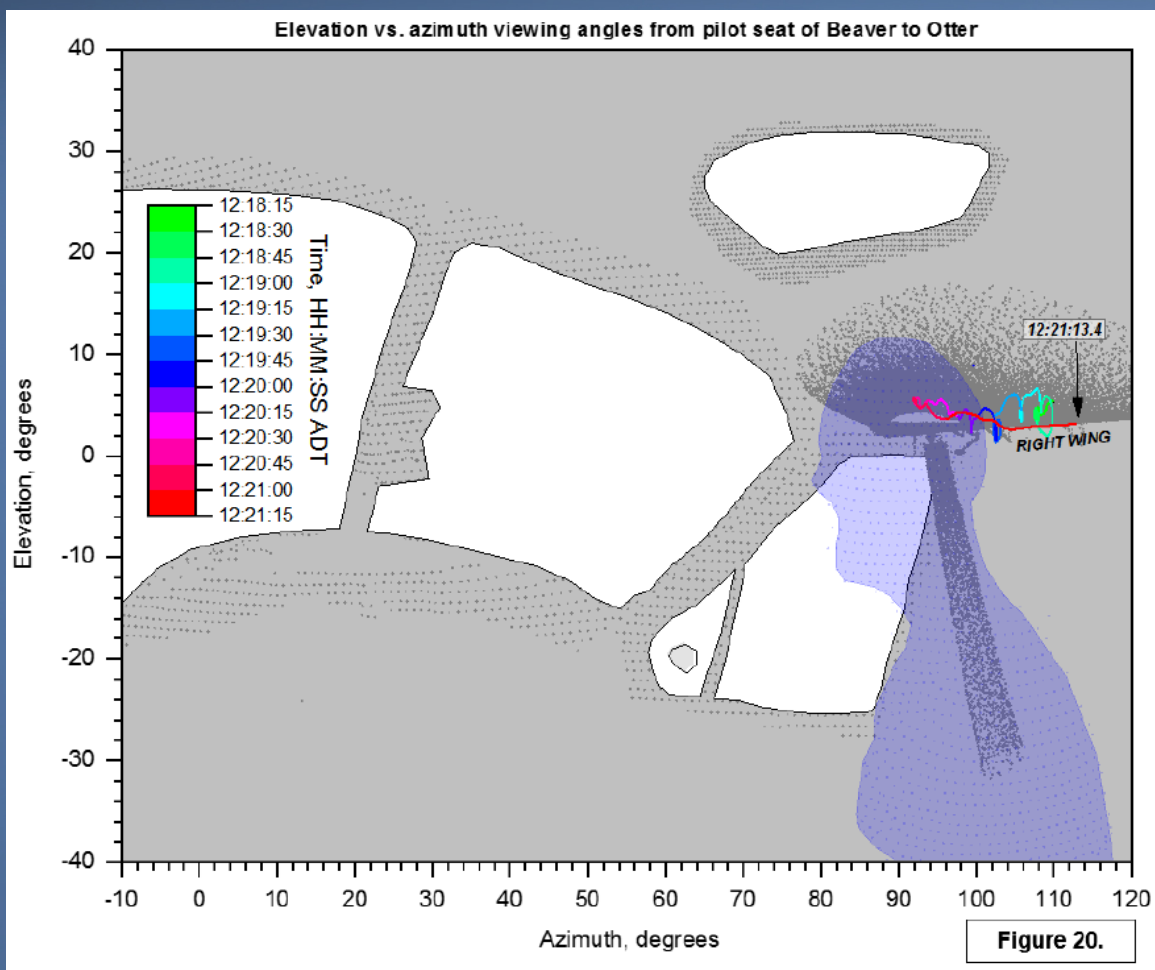
14 CFR 91.113(b), Right-of-Way Rules

“when weather conditions permit... vigilance shall be maintained by each person operating an aircraft so as to see and avoid other aircraft.”

Limits of See-and-Avoid Traffic Separation

- Collision geometry – small target, lack of apparent motion
- Obscuration by aircraft structures – limited field of view
- Human visual limitations – periphery, complex background
- Human attentional limitations – imperfect monitoring, divided attention

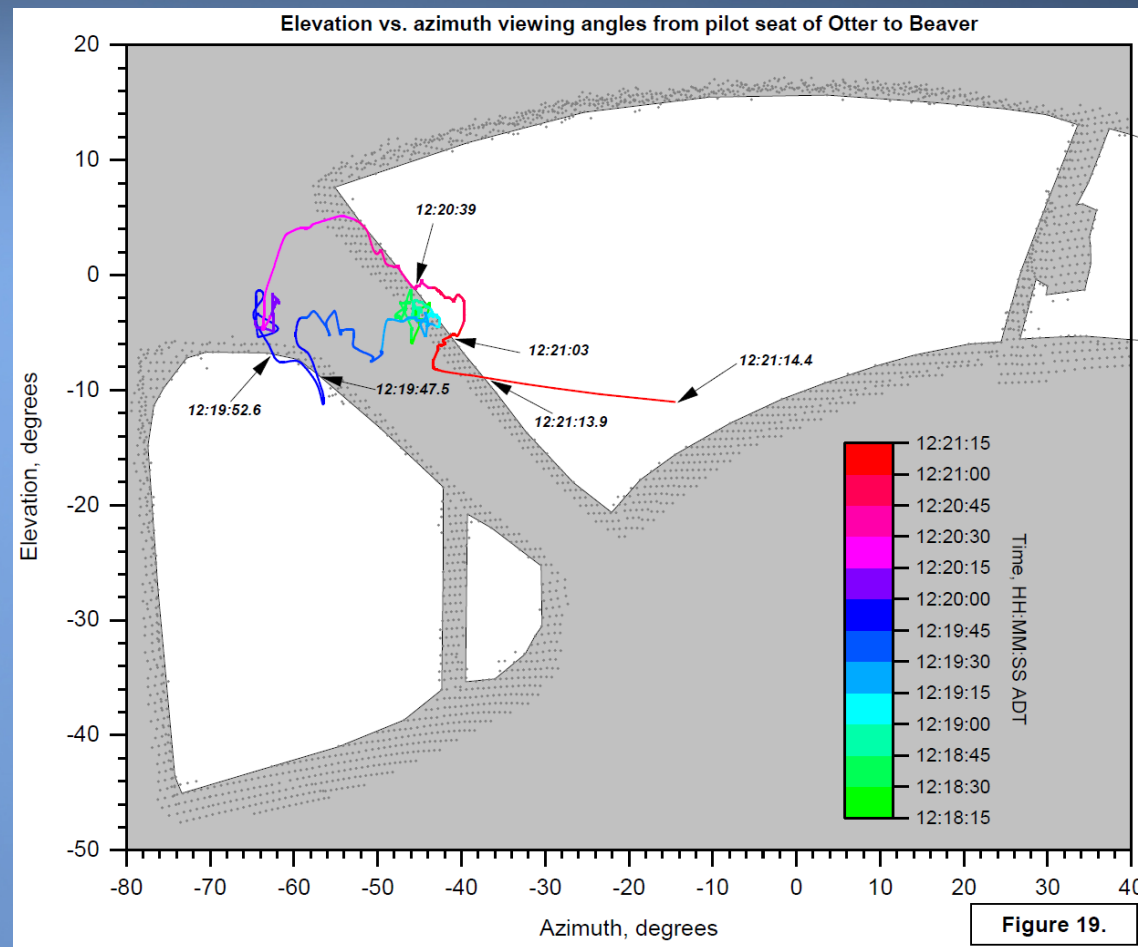
Why the Beaver Pilot Did Not See the Otter



- Beaver visibility study
- Otter approached from the right
- Beaver pilot's view obscured by passenger and right wing

Why the Otter Pilot Did Not See the Beaver

- Otter visibility study
- Pilot's view of Beaver intermittently obscured
- Beaver approached from the left as the pilot maneuvered toward a waterfall on his right
- Neither pilot received an alert



Why the Beaver Pilot Did Not See the Otter on His Cockpit Display



- ForeFlight application could display ADS-B traffic on iPad
- Otter target would not be displayed if:
 - iPad was off
 - ForeFlight not open
 - ForeFlight traffic display not selected
 - ForeFlight “Hide Distant Traffic” setting was selected

Why the Beaver Pilot Did Not See the Otter on His Cockpit Display



If the Otter target was displayed, the Beaver pilot could have missed it, depending on how frequently he was visually scanning the iPad

Why the Otter Pilot Did Not See the Beaver on His Cockpit Display



- Chelton EFIS display was on and showing traffic
- Beaver was depicted as a target
- Missed seeing the Beaver because he last scanned his traffic display four minutes before collision
- Likely did not expect to encounter conflicting traffic on his route

Why the Otter Pilot Did Not See the Beaver on His Cockpit Display



- Chelton display 4 minutes before the collision
- Other traffic was generally aligned with typical route to Ketchikan (dashed green line)
- Otter pilot's intended course was to the right of that route (dashed red line)
- Otter pilot did not expect the other airplanes to cross his path

Importance of Traffic Alerting

- Aural alerts draw pilot attention to conflicting traffic, visual alerts can help them locate it
- Beaver traffic alerts disabled by the Otter's incomplete broadcast of ADS-B data
- Otter traffic alerts disabled by a 2015 equipment change
- Both pilots lacked traffic alerting

Midair Collision Risk

- Midair collisions account for 2% of fatal aircraft accidents, but 7% of fatal Part 135 sightseeing accidents
- A unique risk factor for some Part 91 and Part 135 air tour operators is the concentration of aircraft in some scenic areas
- Use of cockpit traffic displays with aural and visual alerting would reduce the risk of midair collisions in areas with frequent tours

Require Traffic Alerting in High-Traffic Air Tour Areas

- The FAA has the authority to establish temporary Special Federal Aviation Regulations (SFARs)
- The FAA has previously used this authority to improve air tour safety
- Requiring ADS-B-supported airborne traffic advisory systems with aural and visual alerting in high-traffic tour areas, through an SFAR or other means, would reduce midair collisions



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