

# CALLBACK



From NASA's Aviation Safety Reporting System

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## High Density Airspace and Traffic Mix

Through aviation safety reports received by ASRS, the program's expert analysts continually monitor and report on a variety of safety concerns. One such issue involves high-density terminal areas where airspace complexity, traffic mix and volume can contribute to traffic management issues. These high density areas include New York, Los Angeles, Chicago, San Francisco, Dallas-Ft. Worth, and other terminal areas.

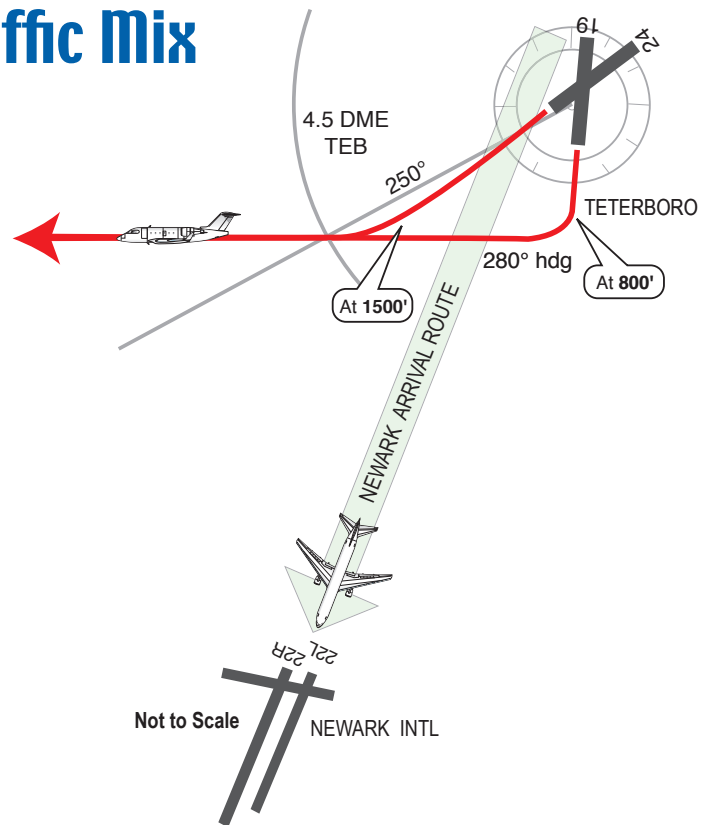
One location that has been the subject in ASRS reports is New York, where pilots and controllers have experienced complex traffic management and flight operational issues due to the proximity of Newark and Teterboro airports.

Teterboro Airport is heavily utilized by corporate aircraft operations due to its convenient proximity to New York City. It is the oldest operating airport in the New York & New Jersey metropolitan area.

Teterboro departures have been the subject of several ASRS Alert Messages, and is a recurring Search Request (SR) for the FAA and Teterboro Users Group (TUG).

At the heart of most TEB incidents reported to ASRS is the TEB 5 SID (95% of the Teterboro incidents reported to ASRS involved this SID). Through the use of specified altitudes and headings, the TEB 5 SID provides separation between Newark, NJ (EWR) arrivals and TEB departures.

Because the intermediate level-off altitude (1,500 feet MSL) and the final departure altitude (2,000 feet MSL) on the TEB 5 departures are quite close together, there is little margin for error when performing the departure procedure. Pilots must also observe noise abatement procedures, which require minimum safe climb power, when operating from the noise-sensitive Runway 24.



*2.8 DME instead of the required 4.5 DME for climbing to 2,000 feet MSL. I instructed the SIC to descend back to 1,500 feet MSL until the 4.5 DME then climb to 2,000 feet. ATC called and indicated that we climbed too early. The departure was properly briefed.*

As reflected in the above incident, ATC intervened in 52% of the TEB incidents reported to ASRS. The flight crew initiated a return to clearance in 32% of incidents.

## ASRS Review of TEB Incidents

Between February 2005 and February 2007, ASRS received 173 reports describing Teterboro, NJ (TEB) departure incidents.

Of these 173 TEB departure incidents reviewed by ASRS, 90% involved corporate-type aircraft operations. Over 75% of incidents occurred on Runway 24 departures. An altitude overshoot occurred in 66% of the incidents. And a conflict was reported with EWR arrivals in 4% of incidents.

The following incident involving a corporate jet flight crew is representative of those reported to ASRS.

■ *Departing TEB we were assigned the TEB 5 departure. Second In Command [SIC] was left seat and flying. After conducting a noise abatement takeoff we climbed to 1,500 feet and made the right turn to a 280-degree heading. I was head down completing the after takeoff checklist when I heard the altitude alerter. Looking up, the SIC was climbing through 1,700 feet. I noticed that we were only*

## Contributing Factors

ASRS analysts who reviewed the TEB report set identified 16 categories of factors that contributed to the incidents.

The following chart shows the leading categories of contributing factors.

Contributing Factor	% of Report Set
Flight crew "behind aircraft"	36%
Breakdown in CRM	32%
Distraction	20%
Misset Altitude Preselect	17%
Misinterpreted/misunderstood SID chart	17%
"Forgot" clearance/SID	16%
Reporter cites problematic procedure	9%

ASRS Alerts Issued in August 2007	
Subject of Alert	No. of Alerts
Aircraft or aircraft equipment	8
Airport facility or procedure	10
ATC procedure or equipment	12
Chart, publication, or nav database	2
<b>Total</b>	<b>32</b>

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August 2007 Report Intake	
Air Carrier/Air Taxi Pilots	2694
General Aviation Pilots	954
Controllers	97
Cabin/Mechanics/Military/Other	306
<b>TOTAL</b>	<b>4051</b>

Breakdowns in Crew Resource Management (CRM) were a factor in almost a third of the TEB incidents. The Captain of an air taxi flight ruefully acknowledged over-dependence on a highly competent First Officer:

■ *...I, as Captain, depended on my First Officer, who is highly experienced and has flown out of TEB many times, to read the departure and set up the panel. He did not notice the 1,500 foot level-off and put 2,000 feet in the altitude window. I made the error of not cross-checking the departure...Two people need to be present when copying ATC clearances and both should review departure procedures.*

For the crew of a lifeguard flight, rushing to get their aircraft off the ground led to their missing the initial altitude level-off (1,500 feet MSL) on the TEB departure.

■ *...We were advised of our mistake by Departure... This was a lifeguard flight and time was of a critical nature. The medical team arrived 45 minutes earlier than scheduled which created a hurry-up atmosphere. Even though I, the Pilot Flying, briefed the departure with my co-pilot, in the rush of things we got caught up and missed the level-off at the required altitude...It doesn't matter how many times we have flown into this airport in the past (which we do on a regular basis), we should...pay more attention to our departure procedures.*

Distraction was cited as a contributing factor in 20% of the TEB incidents. In one instance, a corporate crew departing Runway 24 experienced distraction when concentrating on adherence to the noise abatement procedure.

■ *... The captain and I discussed the SID and noise abatement procedures several times before departure. This aircraft had a noise violation with another crew recently, so we wanted to make sure we followed the noise abatement procedure. This procedure has the aircraft climb at a slower speed –  $V_2+10$  – and reduce power after 300 feet and climb at a steeper angle... After takeoff I became distracted from watching my airspeed and reducing power. I didn't catch my altitude until 1600 feet and immediately pushed the nose over but, it did not level off until 1800 feet....*

In 17% of the TEB incidents, reporters cited missetting of the altitude preselect feature as a contributing factor in the incident. In one typical event,

■ *...Altitude selector was set at 2,000 feet. After departure and in turn to 280 degrees, First Officer (myself) misinterpreted information on MFD and I began climb to 2,000 feet. Captain immediately called altitude and I returned to 1,500 feet MSL...I believe altitude alerter would have been better suited left at 1,500 feet rather than set to final altitude on departure.*

Coupled with comments on setting of the altitude preselect feature were observations on use of available automation to prevent altitude deviations. One corporate Captain noted:

■ *ATC...commented on the climb above the mandatory altitude, chastised us, and cleared us to 2,000 feet. I acknowledged and got a short lecture that we need to level*

*for traffic overhead...First [conclusion] is use of the autopilot. It's uncommon and not considered a good operating practice to select the autopilot in the first 30 seconds of flight, but doing so might have prevented this infraction.*

Reporters cited a problematic TEB departure procedure in 9% of the incidents. As one corporate Captain noted:

■ *A contributing issue is the complexity of the combined SID and noise abatement procedures at TEB. They really should be simplified.*

## Observations

Review of the 173-report set on TEB departure incidents provided several operational observations:

- Although reporters did not often refer to font size or format for the TEB 5 SID, ASRS analysts noted deficiencies in both when referencing the chart during data review.
- A misset altitude selector was cited in 17% of occurrences. The Standard Operating Procedures and pre-departure briefings of many operators suggest that the most restrictive altitude (i.e., 1,500 feet) be set for all departures. This is sound advice. Note that there may be a procedural catch here – when receiving a clearance (e.g., N1234 cleared to the XYZ airport, via the TEB 5 Departure, flight planned route, maintain 2,000 feet...) there is a tendency for crew to set in the cleared altitude, i.e., 2,000 vs. 1,500.
- The intermediate level-off altitude of 1,500 feet on the TEB 5 departures from Runways 24 and 19 is low in order to avoid conflicts with EWR (Newark) arrivals. Some crews of high performance aircraft operating at low gross weight may experience “time compression” during the initial climb. Several operators suggest that crews of such aircraft brief a “power reduction” point, consistent with noise abatement procedures, at an altitude appropriate for their aircraft's performance.



## Collaborative Safety Action

*To help reduce the number (and potential hazards) of TEB SID incidents, the Teterboro Users Group (TUG), FAA, NASA, industry, and others have initiated several mitigation actions, including:*

- *Revised Teterboro SID charts provided by NACO and Jeppesen in an effort to provide clearer, less cluttered information.*
- *Awareness presentations at the TUG meetings.*
- *Providing posters and briefing sheet departure procedure reminders at various Teterboro FBOs.*
- *Major flight training organizations such as Flight Safety incorporating the TEB 5 SID in their training.*
- *A safety awareness article published in Professional Pilot.*