National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date: July 22, 2002

In reply refer to: A-02-15 through -19

Honorable Jane Garvey
Administrator
Federal Aviation Administration
Washington, D.C. 20591

On November 16, 2000, about 1548 eastern standard time (EST), an F-16 fighter operated by the U.S. Air Force (USAF) with the call sign "Ninja2" was involved in a midair collision with a Cessna 172, N73829, near Bradenton, Florida. Ninja2 was the second aircraft in a formation flight of two F-16s (along with the flight leader, whose call sign was "Ninja1")[1] that was on a low-altitude military training mission. N73829 was conducting a personal flight under 14 *Code of Federal Regulations* (CFR) Part 91. Both aircraft were destroyed. The pilot of N73829 was killed, and the pilot of Ninja2 sustained minor injuries while ejecting from the F-16. All three aircraft were operating under visual flight rules (VFR) at the time of the accident. Although the National Transportation Safety Board's investigation is ongoing,[2] preliminary findings have revealed safety issues that warrant the Federal Aviation Administration's (FAA) attention.

Background

About 1513, Ninja1 departed from Moody Air Force Base (AFB), Valdosta, Georgia, en route to the entry point for visual route (VR)-1098.[3] Ninja1 was assigned a block altitude of between flight level (FL) 250[4] and 260 by the Miami Air Route Traffic Control Center (ARTCC), in accordance with instrument flight rules (IFR).[5] Aircraft flying formation flights are usually required to be within 1 mile of each other throughout the flight and are handled as a single aircraft by air traffic control (ATC). As Ninja1 approached the SRQ area, the Miami ARTCC controller cleared the flight to descend to 13,000 feet. At 1543:25, Miami ARTCC informed the Tampa Terminal Radar Approach Control (TRACON) controllers that Ninja1 was "descending into some VR route." At 1543:39, the Miami ARTCC controller instructed Ninja1

[1] Unless otherwise indicated, the term, "Ninja1," is used throughout the document to refer to the formation flight.

[2] The description of this accident, MIA01FA028A, can be found on the Safety Board's Web site at <http://www.ntsb.gov>.

[3] VR-1098 is a low-level military training route (MTR) that begins about 12 miles northeast of the Sarasota Bradenton International Airport (SRQ), Sarasota, Florida. The altitude for the entry point and initial segment of the route is 500 to 1,500 feet above ground level, and its width is 5 miles left of centerline to 3 miles right of centerline.

[4] FL 250 is 25,000 feet mean sea level (msl), based on an altimeter setting of 29.92 inches of mercury.

[5] A composite military IFR/VFR flight plan had been filed for Ninja1.

to contact Tampa TRACON for further services.[6] However, the pilot of Ninja1 was given an incorrect frequency; therefore, he was unable to contact Tampa TRACON.

At 1544:34, after trying, unsuccessfully, to contact Tampa TRACON several times, the pilot of Ninja1 reestablished contact with Miami ARTCC and informed the controller that he wished to cancel his IFR flight plan. The controller accepted the cancellation and asked the pilot if he wished to continue receiving radar traffic advisory services. The pilot declined. The controller instructed Ninja1 to set code 1200 (standard for visual operations) in the aircraft's radar transponder and terminated radar traffic advisory services. Ninja1 then began a VFR descent to enter VR-1098. (See figure 1.)

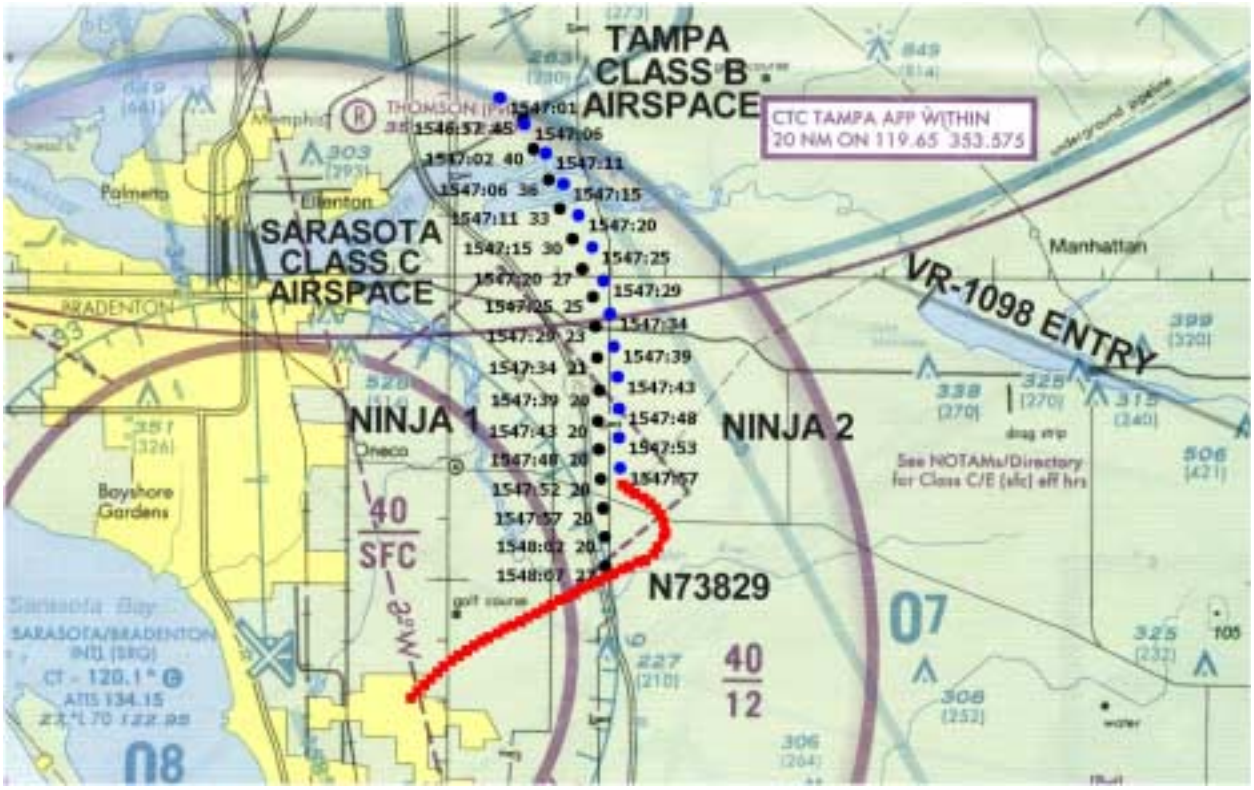

Figure 1. Radar tracks showing the flightpaths of Ninja1, Ninja2, and N73829.

About 1541, N73829 departed SRQ en route to the Albert Whitted Airport, St. Petersburg, Florida.[7] N73829 initially headed east. About 1545, the Tampa TRACON controller identified N73829 on radar and instructed the pilot to maintain 1,600 feet. About 1547, the controller instructed the pilot of N73829 to fly heading 320º and climb to 3,500 feet. The Safety Board notes that the pilot appears to have complied with all ATC instructions and

[6] ARTCCs have responsibility for all controlled airspace in the United States. In areas where high concentrations of air traffic are found, ARTCCs delegate ATC responsibility to TRACON facilities. TRACONs are normally responsible for airspace extending 30 to 60 miles from airports and up to 10,000 to 15,000 feet msl.

[7] Sarasota lies within class C airspace; therefore, the pilot was required to accept VFR traffic advisory services on take off.

followed standard procedures for operating in class C airspace. At no time did N73829 enter the boundaries of VR-1098.

Also about 1547, Ninja1 was heading south and descending through 4,300 feet on a converging course with N73829. By this time, Ninja1 had overshot its intended entry point to VR-1098, and, at this time, it was several miles southwest of the MTR. Ninja1 had also inadvertently passed through the Tampa class B airspace without the required ATC clearance and was about to enter the Sarasota class C airspace without establishing communications with ATC, which is required by Federal regulations. The Tampa TRACON mode C intruder[8] conflict detection software noted a possible conflict between Ninja1 (the airplane) and N73829 and, at 1547:39, generated an aural conflict alert in the TRACON facility that continued until 1548:03.[9] Subsequently, the Tampa controller informed N73829 that there was "traffic off your left side ahh two thousand"; however, because the flightpaths of the two targets (Ninja1 and N73829) did not indicate that a collision was imminent, he took no other action. The pilot of N73829 did not respond to the controller's statement.

The flightpath of N73829 was in direct conflict with that of Ninja2, which was approaching N73829 from the right. Ninja2 was flying less than 1 mile behind and slightly to the east of Ninja1. However, the conflict detection system did not account for Ninja2 or its possible conflict with N73829. This happened because technical limitations of ATC radar systems generally dictate that only the lead airplane of a formation flight can operate its transponder. As a result, other aircraft in formation flights normally do not operate their transponders. Therefore, Ninja2 could only be detected by Tampa's radar as a primary target, not a secondary target.[10] Primary targets are not eligible for conflict detection processing because no altitude information is available for them. Thus, the only way that the controllers could have detected the conflict between N73829 and Ninja2 would have been to visually observe Ninja2's primary target heading toward N73829's secondary target on the radar display. During postaccident interviews, Tampa controllers stated that they did not notice the Ninja2 primary target on their radar displays. The collision occurred about 2,000 feet msl, about 6 miles southwest of the entry point for VR-1098.

Dissemination of Information About Formation Flights and Military Training Routes

During postaccident interviews, the Tampa controllers stated that they were unaware that Ninja1 was a formation flight that included two aircraft. At ATC facilities that use printed flight progress strips,[11] information about the number of aircraft in a formation flight is usually

[8] The mode C intruder conflict detection software warns controllers when an aircraft receiving ATC radar service is predicted to conflict with other radar-observed traffic, even if the other aircraft is not under ATC control (as was the case with Ninja1).

[9] According to radar data, Ninja1 leveled off about 2,000 feet msl after its descent.

[10] Surveillance radar fall into two categories: primary and secondary. Secondary radar broadcasts an interrogation signal to equipment on board an aircraft that automatically responds by transmitting information to the ground-based site for processing and display. Secondary radar returns contain an identification code and altitude data. Primary radar broadcasts radio waves and detects the reflections of the waves off objects (including airplanes). Primary radar reflections do not contain any identification or altitude information.

[11] Flight progress strips are printed records of information about particular aircraft, such as aircraft identification, number and type of aircraft, airspeed, altitude, route of flight, and other pertinent remarks.

available to controllers in the "aircraft type" section of the flight progress strip. However, the investigation has revealed that local procedures at some TRACONs, including the Tampa TRACON, do not require the use of flight progress strips in all cases.[12] The Tampa TRACON does not ensure that controllers receive this information through other means. As evidenced by this accident, if controllers are unaware that a formation flight is in progress, they most likely will be focused on the flight lead and, therefore, will not take other aircraft in a formation flight into account when looking for and trying to prevent potential traffic conflicts. Further, FAA Order 7110.65, "Air Traffic Control," Paragraph 5-5-8, "Additional Separation for Formation Flights," states "because of the distance allowed between formation aircraft and lead aircraft, additional separation is necessary to ensure the periphery of the formation is adequately separated from other aircraft, adjacent airspace, or obstructions…Separate a standard formation flight by adding 1 mile to the appropriate separation minima." Therefore, controllers must have accurate information about the number of aircraft in formation flights to ensure adequate separation.

Further, at TRACONs that do not require the use of flight progress strips, controllers may also lack other important information, such as destination information, that would be displayed in the "remarks" section of a flight progress strip. Controllers at such facilities generally obtain flight destination information by observing an aircraft's radar data block. However, destination information for aircraft intending to fly to a VR entry point (or other airborne location) is too large to fit within the space allowed in the data block, and it is not displayed.[13] Therefore, the controller must obtain the destination information by asking the pilot for it on initial contact.[14]

Not having complete information may lead controllers to inadvertently apply less than required separation between formation flights and other IFR aircraft operating nearby or provide incomplete traffic advisory information to such aircraft. Therefore, the Safety Board believes that the FAA should amend procedures used at ATC facilities that permit operation without flight progress strips to ensure that controllers are provided with all information necessary to meet their separation and traffic advisory responsibilities, including all information on formation flights that would be displayed on flight progress strips.

Safety Board investigators also found that the Tampa TRACON controllers involved in this accident were unfamiliar with the existence and location of VR-1098 even though the route starts inside their area of responsibility. During postaccident interviews, when asked about what information on MTRs was included in the controller training program, a controller who had been providing instruction to a trainee at the sector at the time of the accident stated that there was

[12] For example, the Safety Board became aware that the Charlotte, North Carolina, TRACON does not require the use of flight progress strips. FAA Order 7110.65, "Air Traffic Control," paragraph 2-3-1, states that "unless otherwise authorized in a facility directive, use flight progress strips to post current data on air traffic and clearances required for control and other air traffic control services."

[13] The destination information for Ninja1 was "MCF159023, 23 miles southeast of MacDill AFB," indicating that the IFR portion of the flight was to terminate 23 miles southeast of MacDill AFB on the 159° radial from the base.

[14] As noted previously, the Tampa TRACON controllers never communicated with Ninja1; therefore, the only information they received about the flight was from Miami ARTCC stating that it was "descending into some VR route."

"probably some mention of it." Further, the supervisor on duty at the time of the accident stated that he had never cleared an aircraft into VR-1098 and that the route is not used frequently.

In this case, the lack of awareness about Ninja1's intent to enter VR-1098 and about the location of the route's entry point reduced the Tampa TRACON controller's ability to detect and react to Ninja1's navigational error, notice its unapproved entries into class B and class C airspace surrounding the Tampa and Sarasota airports, and perceive the subsequent traffic conflict with N73829. Further, because MTRs are often used by aircraft operating at high speeds and low altitudes in airspace in which conflicts with other aircraft may occur, all controllers need to know about their existence and locations. Therefore, the Safety Board believes that the FAA should provide initial and recurrent training to all air traffic controllers regarding the location of all MTRs and the types of operations conducted on any MTRs beginning in, passing through, or terminating in their areas of responsibility.

Finally, the investigation revealed a deficiency in the accessibility of MTR and other safety information that relates to a particular route of flight. Title 14 CFR Section 91.103, "Preflight Action," requires that "each pilot in command shall, before beginning a flight, become familiar with all available information concerning that flight." The *Aeronautical Information Manual* (AIM), Paragraph 3-5-2, "Military Training Routes," states the following:

> Nonparticipating aircraft are not prohibited from flying within an MTR; however, extreme vigilance should be exercised when conducting flight through or near these routes. Pilots should contact FSS's [flight service stations] within 100 NM [nautical miles] of a particular MTR to obtain current information or route usage in their vicinity. Information available includes times of scheduled activity, altitudes in use on each route segment, and actual route width….When requesting MTR information, pilots should give the FSS their position, route of flight, and destination in order to reduce frequency congestion and permit the FSS specialist to identify the MTR which could be a factor.

Further, AIM, Paragraph 7-1-3, "Preflight Briefing," states the following:

> Pilots may obtain the following from AFSS [automated flight service station]/FSS briefers upon request:
>
> (a) Information on military training routes (MTR's) and military operations area (MOA's) activity within the flight plan area and a 100 NM extension around the flight plan area.
>
> NOTE - Pilots are encouraged to request updated information from en route AFSS's.[15]

[15] Similarly, FAA Order 7110.10, "Flight Services," Paragraph 3-2-1, "Conduct of Standard Briefing," states that FSS briefers should, upon request, do the following: "provide information on military training routes (MTR) and military operations area (MOA) activity within your flight plan area plus an additional 100 NM extension. For briefings beyond the above stated area, advise the pilot that information may be incomplete and to contact other en route facilities for additional information."

This guidance appears to indicate that if a pilot requests information about MTRs, the FSS briefer will determine which MTRs affect the aircraft's route and provide the pilot with the appropriate MTR usage information. However, information received from FSS personnel during followup investigation of this accident indicates that pilots are not likely to receive such service. FSS personnel indicated that their current automated briefing system is unable to correlate a pilot's route of flight with particular MTRs and, therefore, that FSS briefers expect pilots to ask for MTR information by specific route number so that the information about that route can be obtained from a separate database, which is not accessible through the automated briefing system.

In this case, the pilot of N73829 most likely did not seek information about MTRs because his intended route of flight did not intersect the only MTR in the vicinity (VR-1098). Nonetheless, the Safety Board is concerned that pilots, FSSs, and ATC facilities do not have access to a reliable means of identifying active MTRs and other possible hazards to flight, such as special use airspace and temporary flight restrictions. According to FAA Aviation Safety Reporting System staff, 141 incidents were reported between 1995 and 2000 that involved operations on MTRs. Further, the FAA's Near Midair Collision Database contains several reports of near midair collisions between aircraft operating on or in the vicinity of MTRs. To reduce the likelihood of such incidents, preflight briefings should provide pilots with reliable information on all airspace-related activities known to the FAA that may present a hazard to flight or otherwise require increased vigilance by pilots. This may require the development of automation systems that are capable of comparing pilot-provided information with available airspace status information and automatically detecting situations in which conflicts may occur.

Although basic MTR usage information is generally available from various sources, such as FSSs, Direct User Access Terminal briefings, military base operations, and VFR charts, it is not organized and presented in a manner that can be quickly applied to a particular route of flight. Therefore, the Safety Board believes that the FAA should develop automation capabilities to ensure that pilots, FSS briefers, and air traffic controllers can access current and comprehensive information on MTRs, special use airspace, and other safety-of-flight information that is organized and presented in a manner in which it can be readily understood and applied to specific flight operations.

Radar Traffic Advisory Services for Military Flights Operating Under Visual Flight Rules

On September 7, 2000, a near midair collision occurred between a Boeing 757 and a USAF F-117 operating under VFR approximately 11,000 feet over Los Angeles International Airport, Los Angeles, California.[16] In response, Safety Board investigators met with USAF representatives to identify actions that could reduce the likelihood of conflicts between military training flights and civil aircraft operations. As a result, the USAF amended Air Force Instruction 11-202, "General Flight Rules," effective February 9, 2001, to require pilots of USAF aircraft operating under VFR to request and utilize VFR radar traffic advisory services to the maximum extent practical. It is possible that the collision between N73829 and Ninja2 might not have occurred if this instruction had been in effect at the time of the accident and Ninja1 had

[16] For more information, see NTSB Safety Recommendation A-01-11, April 24, 2001.

complied with it and continued receiving radar traffic advisory services after it canceled its IFR flight plan. To facilitate compliance with this USAF instruction, the Safety Board believes that the FAA should ensure that all controllers responsible for providing radar traffic advisory services are briefed on both the September 7, 2000, near midair collision in Los Angeles and the November 16, 2000, midair collision near Bradenton, Florida. Further, the Safety Board believes that the FAA should amend FAA Order 7110.65, "Air Traffic Control," to require that air traffic controllers provide radar traffic advisory services to military aircraft operating under VFR whenever radar and communications coverage permits.

Therefore, the National Transportation Safety Board recommends that the Federal Aviation Administration:

> Amend procedures used at air traffic control facilities that permit operation without flight progress strips to ensure that controllers are provided with all information necessary to meet their separation and traffic advisory responsibilities, including all information on formation flights that would be displayed on flight progress strips. (A-02-15)
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> Provide initial and recurrent training to all air traffic controllers regarding the location of all military training routes (MTR) and the types of operations conducted on any MTRs beginning in, passing through, or terminating in their areas of responsibility. (A-02-16)
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> Develop automation capabilities to ensure that pilots, flight service station briefers, and air traffic controllers can access current and comprehensive information on military training routes, special use airspace, and other safety-of-flight information that is organized and presented in a manner in which it can be readily understood and applied to specific flight operations. (A-02-17)
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> Ensure that all controllers responsible for providing radar traffic advisory services are briefed on both the September 7, 2000, near midair collision in Los Angeles, California, and the November 16, 2000, midair collision near Bradenton, Florida. (A-02-18)
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> Amend FAA Order 7110.65, "Air Traffic Control," to require that air traffic controllers provide radar traffic advisory services to military aircraft operating under visual flight rules whenever radar and communications coverage permits. (A-02-19)

Chairman BLAKEY, Vice Chairman CARMODY, and Members HAMMERSCHMIDT, GOGLIA, and BLACK concurred with these recommendations.

Original Signed

By: Marion C. Blakey
Chairman