approximately 85 miles off the coast of Virginia.

## Vehicle Safety Approval Criteria

The three criteria enumerated in the March 24, 1992 Notice for the first COMET mission, and now METEOR, all of which would have to be satisfied under the Notice, are as follows:

1. The probability of the reentry vehicle landing outside the designated landing site shall not be greater than three in one thousand missions.

2. The additional risks to the public in the immediate vicinity of the landing site (i.e., the area within 100 miles of the designated landing site) shall not exceed the normal background risks to which those individuals would ordinarily be exposed but for the reentry missions. This normal background risk is characterized as: the probability of any casualty occurring within the 100mile zone shall not exceed one in a million on an annual basis. In addition, the probability of any casualty occurring within the zone shall not exceed one in a million for a single mission.

3. The additional risks to the general public beyond the 100-mile zone around the designated landing site, and to property on orbit, shall not exceed normal background risks to which the public would ordinarily be exposed but for the reentry missions. This normal background risk is characterized as: the probability of any casualty occurring shall not exceed one in a million on an annual basis. In addition, the probability of any casualty occurring in the area that is both outside of the designated landing site and the 100-mile zone around the site shall not exceed one in a million for a single mission.

The March 24, 1992 Notice also provides supporting rationale for the criteria and explains their separate but interrelated safety objectives generally as follows:

• Criterion 1 is intended to assure reliable, accurate, incident-free reentry operations in order to foster public acceptance of commercial space transportation and minimize public exposure to risk. Criterion 1 assumes nominal pre-reentry operations conditions and addresses factors that affect accuracy after reentry is initiated. In its petition, EER has requested that OCST waive this criterion.

• Criterion 2 is intended to limit risks to the population that believes it may be more exposed to hazards resulting from commercial reentry operations because of their proximity to the designated landing site and to ensure they face no greater risk from commercial reentry operations than ordinary background risk. Criterion 2 becomes most relevant in the event of a system error or failure that causes a deviation from the vehicle's planned trajectory.

• Criterion 3 is intended to limit risks to the general public to ensure it, too, faces no additional risk beyond ordinary background risk as a result of commercial reentry activities. Criterion 3 addresses the risks posed by an essentially random reentry as a result of a major system failure during the reentry process.

• As stated in the March 24, 1992 Notice, the criteria acknowledge that some hazards, and therefore risks accompany the proposed reentry activity. The criteria reflect those hazards reduced to acceptable levels of risk. Through the criteria, the Office has established a level of acceptability comparable to that employed in other safety regulatory regimes, such as those administered by the Environmental Protection Agency, and consistent with risk thresholds utilized by Federal launch ranges as part of range safety.

Since early 1992, when the criteria addressing the COMET Program proposal were established, the design of the reentry vehicle system and the proposal to reenter it have evolved and matured. These developments have allowed the Office to assess specific aspects of reentry risks and their impact on public safety with greater clarity.

The three criteria are intended to address the risks to public safety that result from a human-induced reentry. For the majority of its mission, the risks presented by the METEOR reentry vehicle system are the same as those presented by other space payloads. It is the fact that the METEOR reentry vehicle is operated so as to land at a designated landing site and designed to withstand the stress of reentry that raises the potential of risk to public safety. Accordingly, in evaluating whether METEOR satisfies the criteria. the Office considers only humaninduced or intentional reentries. The Office has determined that a humaninduced reentry occurs when reentry is intentionally initiated upon command from ground personnel and the vehicle returns to earth within one orbit. The Office believes that there should be a direct relationship between initiating reentry and the reentry event itself for it to be considered human-induced or intentional. If the vehicle does not reenter upon command within one orbit, the direct relationship is broken and the vehicle remains on orbit as any other payload. A malfunctioning vehicle that remains on orbit and then reenters the atmosphere as a result of orbital decay or other intervening events has not completed a human-induced or

intentional reentry and the criteria do not apply.<sup>2</sup> Thus, the Office considers only those system failures or nominal system variations that may occur during the course of a "human-induced" or intentional reentry in assessing METEOR's ability to meet Criteria 1, 2 and 3.

## **Petition to Waive Criterion 1**

EER's petition requesting relief from Criterion 1 is based, in part, on its misunderstanding of performance-based criteria. In establishing performancebased criteria for COMET, the Office stated its belief that, unlike design standards, "performance-based criteria allow the maximum flexibility in developing a safe and cost-effective product. The Office further believes that performance-based criteria enhance the public interest by encouraging innovation and technology development. This environment promotes safe space transportation services at lower cost and helps assure that customers' needs are addressed.' (57 FR 10213, 10215)

In its petition, EER asserts, among other things, the difficulty of using performance-based standards to demonstrate reliability in the absence of flight performance history. EER further maintains that satisfying Criteria 2 and 3, without Criterion 1, would be sufficient to ensure that public safety is not compromised. EER suggests that Criterion 1 affords no additional protection to the public beyond that provided by satisfying Criteria 2 and 3.

Although the Office disagrees with EER's characterization of performancebased standards, the Office has evaluated whether Criterion 1 may be waived for the METEOR reentry mission without jeopardizing public safety. The Office undertook this evaluation because it is consistent with the Department's statutory mandate to issue a favorable payload determination allowing METEOR to be launched for its intended reentry mission if the Office finds that the proposed mission can be conducted without jeopardizing public safety and U.S. national interests.

<sup>&</sup>lt;sup>2</sup> Even if an operator attempts an intentional reentry, it may fail for a number of reasons. METEOR includes a number of built-in fail-safe systems that automatically terminate the reentry sequence if certain conditions that would cause an inaccurate or otherwise unsafe reentry are detected. In addition, a system required for reentry to proceed could fail, leaving the reentry vehicle on orbit for more than one orbit. In both instances, there has not been a human-induced reentry and the spacecraft assumes a status essentially equivalent to other objects left in space. In the Office's assessment of the vehicle, neither of these failure scenarios are considered in determining whether the criteria have been met.