Decision Criteria for Recovery of M4352-1

A. Likelihood of Survival

Condition of the SRV: A review of archived documents by [redacted] a reentry vehicle engineer for General Electric for a number of programs including Corona, Gambit and Hexagon) resulted in the following reconstruction of the events in 1982. (b)(3)

The SRV did not physically separate from the M4352 spacecraft due to a malfunction in the spacecraft-to-SRV separation squibs. However, appropriate electrical signals were received by the SRV that activated the recovery batteries and started the backup timer. After approx 250 sec. the backup timer sent the signal to separate the Thrust Cone (T/C) from the Reentry Vehicle (RV). This left the T/C (with the retro motor) attached to the spacecraft and imparted a small separation velocity (maybe 1 fps) to the RV (which consists of the recovery capsule, the heat shield and the parachute). Approx. 1776 seconds later, the RV backup and recovery timers sent the signal to deploy the parachute cover, which also ejects the heat shield at an approx. 1-2 fps. separation velocity from the capsule. This leaves the capsule (containing the film), the parachute, and parachute cover all attached and separated from everything else. The ejection force of the parachute cover probably was insufficient to fully deploy the deceleration chute (it normally takes aero drag to do this) but it is conceivable that some partial deployment occurred. The most probable configuration we are left with is the gold-plated aluminum capsule (approx 180 lbs) attached to the main parachute (fully bagged, nylon, approx. 15lbs) attached by a line to the partially deployed decel chute (nylon, approx 5 lbs), which is attached to the parachute cover (aluminum and fiberglass, 9 lbs.) [redacted] a VAFB engineer who had also worked the Gambit program, also concurred in this analysis. (b)(3)

[redacted]

(b)(1)
(b)(3)

One of the functions of the backup timer is insure the capsule is destroyed during reentry if the normal recovery sequence of events do not occur. Discussions of survivability must include consideration of the fact that the design engineers intended the current configuration of the bucket to preclude survival.

The assessment of the design engineers mentioned above is that the exposed aluminum inner bucket will be destroyed by reentry heating. The passage of the exposed parachute to the hypersonic flow during reentry will result in the parachute being destroyed. It is not known whether the 67 pounds of film would survive the destruction of the inner bucket and the subsequent exposure of the film to heating during reentry. The Aerospace Corporation reentry expert [redacted] provided the following assessment: (b)(3)

> *Although the main parachute is partially deployed, it will have no bearing on the ultimate "fate" of the capsule. The external aluminum capsule is expected burn up upon reentry, leaving the film exposed to the incident air stream and heating. The outer layers of film will be charred, however, the inner layers of the 67-pound "roll" are expected to reenter in relatively good condition. Surviving material should be recognizable (to the trained eye).*

So there is no chance of a soft landing – any items that might survive reentry will be heat damaged and will strike the ground or water at very high speed. It is important to recognize that the film on the roll is very sensitive to light and that it is <u>undeveloped</u>. The film return programs all had issues with space radiation fogging the film – and this bucket has been in orbit, exposed to that radiation for almost 20 years. The intense light experienced as the bucket burns up around the film during the reentry process plus the intense heating would be expected to have a significant effect on the film emulsion. The probability of anyone finding the material, recognizing that it may be undeveloped film (a trained eye), protecting it from light, and finally using the exacting process necessary to develop this film to its potential is unknown, but can't be very significant. The film itself has been released for commercial uses several years ago, so getting access to charred remnants of the film web should not be a security issue.

In summary, the most likely items to survive reentry will be some quantity (67 lbs or less) of partially charred undeveloped film, possibly still on a film spool, that has been exposed to intense heat and light during the reentry.

B. Is Satellite Recoverable?

The film and film spool would only be recoverable if it fell in a very shallow water area or on land. Determining the actual location of any pieces from the SRV will be difficult due to its small size. The film itself is plastic, so only the film spool could be expected to have any radar return at all.

If the impact location is predicted to be in water more than a few tens of meters deep, the lack of security or intelligence value of the charred roll of film would seem to preclude committing any significant assets to the search.

C. Additional Inputs/Discussion/Recommendation

Sensitive components on a typical Gambit film bucket are limited to exposed film. In this case, the film has been exposed to solar radiation since January 1982 as well as heating and intense light from reentry and is therefore of little intelligence or security value. As a result, the risk to the US of an adversary of recovering this film is thought to be very low.

Recommendation: IMINT assessment is that unless impact of any surviving pieces occurs on easily accessible land that no recovery effort be attempted.