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# Defense Intelligence DIGEST

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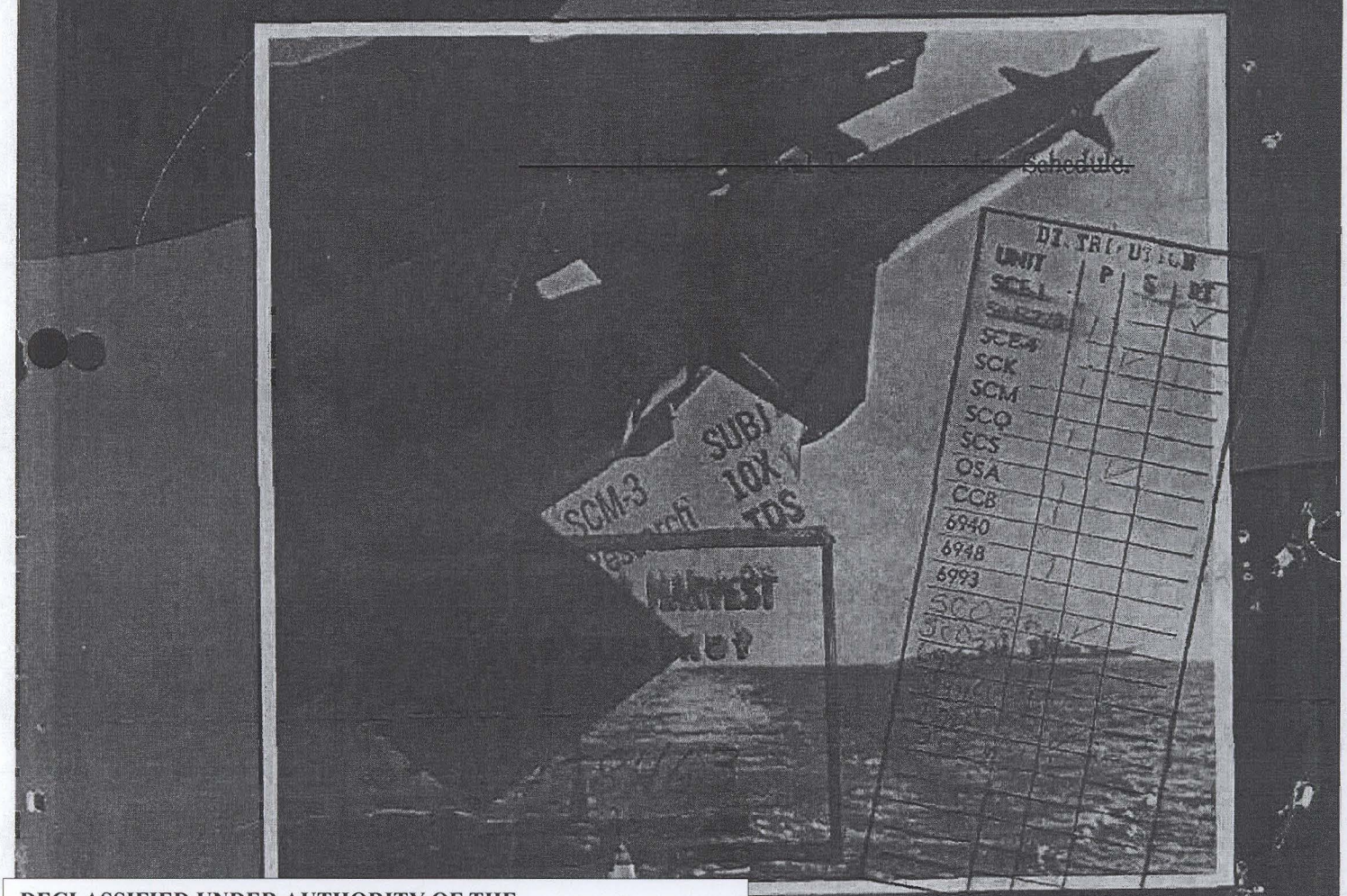




DEFENSE INTELLIGENCE AGENCY



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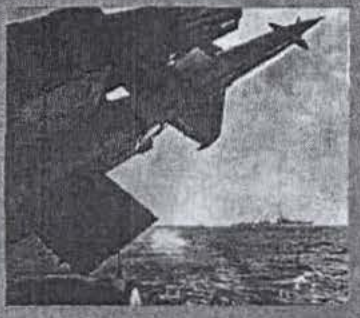

*Soviet naval power in the Mediterranean reached peak levels this year. For details see article beginning on page 4.* [U]


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## FOREWORD

**MISSION:** The mission of the monthly *Defense Intelligence Digest* is to provide all components of the Department of Defense and other United States agencies with timely intelligence of wide professional interest on significant developments and trends in the military capabilities and vulnerabilities of foreign nations. Emphasis is placed primarily on nations and forces within the Communist World.

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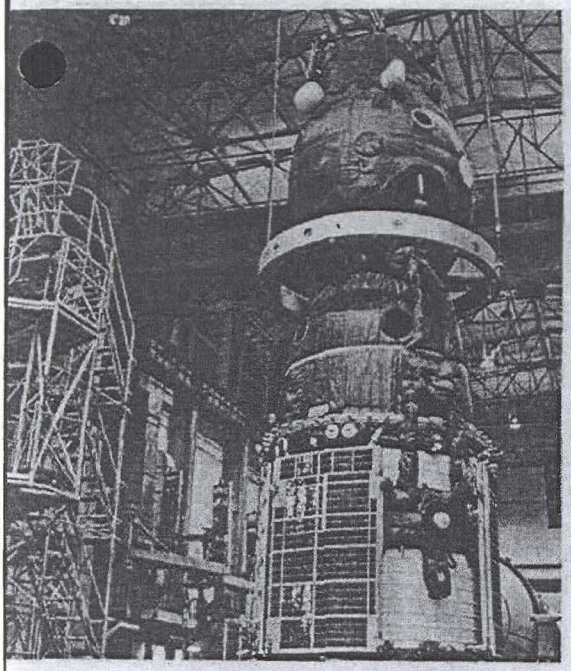
D. V. BENNETT
Lieutenant General, USA
Director

# ZOND AND SOYUZ

# IN LINE WITH SOVIET



*Soyuz spacecraft on assembly pad* [U]

"The Soviets typically use 60 percent conventional or proven hardware on a new spacecraft and 40 percent of the spacecraft is composed of new equipment developed for the specific mission."

Professor G. M. Zhivotovskii
USSR Academy of Sciences

A RECENT Moscow television program, entitled "Space Researcher," has provided additional information on the Zond 5 and Soyuz re-entry capsules.* Comparative shape of the two vehicles indicates that they are similar and could be identical. Such similarity was suspected previously, because of general agreement of spacecraft weight assessments, mission compatibility, and re-entry capabilities.

While shape analysis has shown that the two capsules are similar in external configuration and general size, precise sizing has not been attempted because of TV picture distortion. Moreover, the orbital rest compartment present on the Soyuz capsule may not be on the Zond—Soviet drawings and descriptions of the Zond 5, 6, and 7 circumlunar missions do not indicate such a compartment. Both capsules have access/parachute hatches and a common stepped projection situated in the same relative position on the vehicle surface.

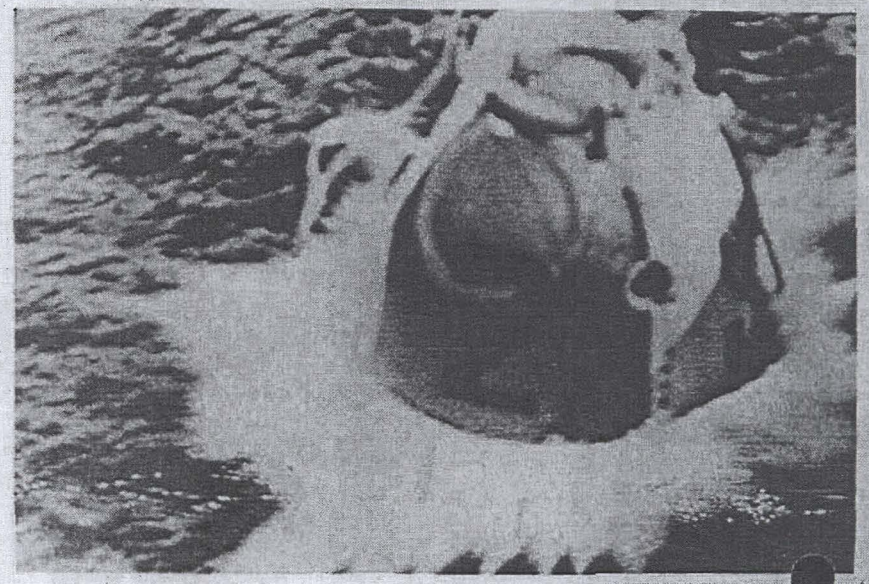
*See "Effects of Zond Vehicle on Soviet Space Program," July 1969 issue, page 30, and "Progress and Prognosis for Soviet Soyuz," August 1969 issue, page 11.

## Common re-entry features

The Soviets have described the Soyuz and Zond spacecraft as having both a lifting and ballistic re-entry capability. Although they may have employed the lift vector control option early in the Soyuz test program, Cosmos 212 was the first Soviet mission on which sufficient re-entry data was obtained to indicate the use of such an option. Soviet announcements confirm that the direction of lift vector was controlled during the Soyuz 2, 3, 4, and 5 re-entries, thereby greatly reducing the G loads and impact errors.

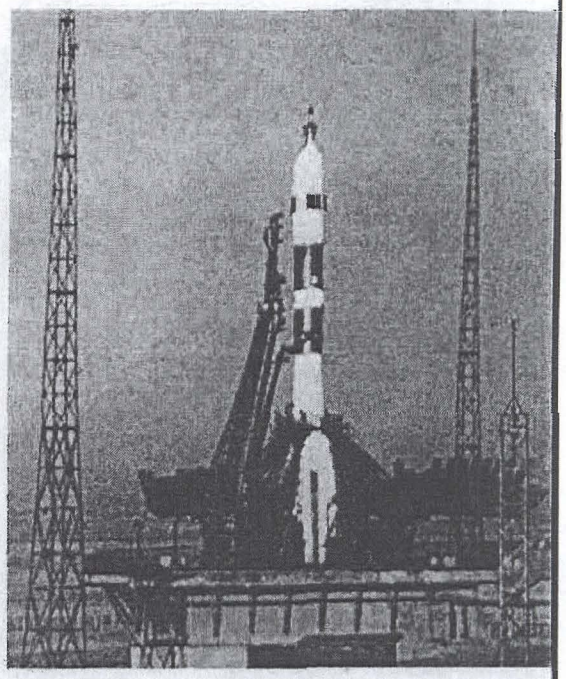
Last April M. Keldysh, President of the USSR Academy of Sciences, substantiated the existence of these re-entry options by stating "that although Zond 6 employed lift vector control during re-entry, it could perform a ballistic landing if it were spinning throughout its atmospheric penetration . . . and . . . such a

*Soyuz re-entry vehicle, as shown on Soviet TV, undergoing water impact test.* [S]



# DESIGN SIMILARITIES

# HARDWARE PHILOSOPHY



*Soyuz launch vehicle* [U]

variant was performed during the earlier Zond 5 mission."

The configuration and design of the Zond and Soyuz capsules further attest to such re-entry options. Both spacecraft have axisymmetric bodies—composed of a blunt heat shield attached to a bell-shaped section. Their center of gravity is displaced from the centerline causing the capsules to stabilize aerodynamically with a given angle of attack. The vehicle attitude creates a non-symmetric airflow around the surface and produces an aerodynamic lift. The direction of the lifting force is controlled by rotating the re-entry vehicle about its axis. The aerodynamic force generated during re-entry can either be used to provide trajectory control, or the spacecraft can roll constantly about the axis to cancel the lift vector and allow re-entry to occur along a ballistic trajectory. US capsules have been designed with these same trajectory options.

*TV photo of Zond 5 capsule being loaded on board recovery ship, Golovnin.* [S]

## Tracking data

To date, radar tracking data during re-entry have been obtained on only three Soyuz re-entries (Cosmos 212, 238, and Soyuz 3). No tracking data were obtained on the Zond re-entries.

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Computer simulations conducted using Soyuz 3 re-entry data and the associated impact point (50–28N/72–50E—filed by the Soviets in their international report on the Soyuz mission) indicates that Soyuz 3 had an L/D of .25. Trajectory simulation of the Zond 6 re-entry profile suggests an L/D of .20 to .30 would be sufficient to provide the 5,000-nautical-mile downrange distance achieved during the Zond 6 re-entry.

Additional similarities between the Soyuz and Zond capsules have been observed in propulsion and orientation techniques and in [redacted] instrumentation, and solar-power systems. These similarities imply that the instrumentation compartment of both spacecraft may be identical or at least share common subsystems. [END]

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