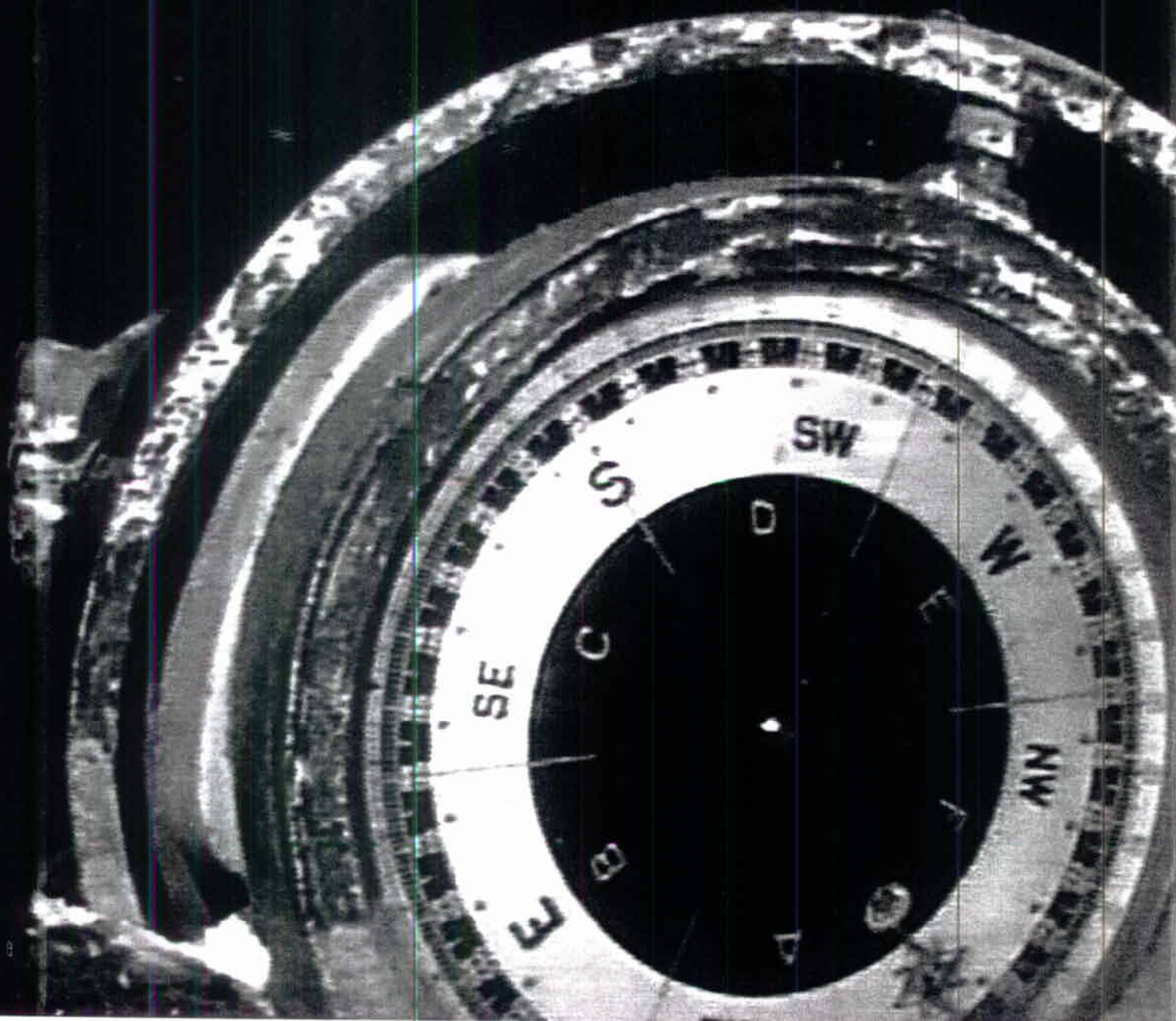


by david w. jourdan

# NEVER FORGOTTEN

the search and discovery of Israel's lost submarine DAKAR



The uniform was restored and presented to Yosef's family. According to their wishes, it is now on display at the naval museum in Haifa.

The ROV and its patient team of operators still had work to do. The vehicle was again reconfigured, this time to collect a complete vertical-view mosaic. Another day was spent with this task. Finally, the remaining items of interest were recovered. The last item found in the extensive debris field was the emergency buoy basket. A piece of the mystery fell into place as the ROV cameras peered inside to discover the basket—empty! No reel, no wire, no horn. We can never prove it for sure, but my theory that the buoy, that “orange herring,” floated around the Mediterranean just submerged, trailing the wreckage of its wire and reel, was largely confirmed by that find.



The delivery of the final report of findings was anticlimactic. In fact, we didn't even go to Israel to present it. The situation in the region had deteriorated for visiting, and there was not a large budget for such activities. So a detailed and extensive written report was produced, complete with CDs containing the final photographic mosaic, all digital still images, chemistry files, and artifact reports. Tom, Robin, and Marci gave their briefings to the camera, and their filmed presentations were shipped with the report to Israel. It was unfortunate that we didn't have more of a ceremonial presentation, but the circumstances didn't favor it.

Still, the *Dakar II* mission was a complete success. The dramatic arrival of the bridge fin to shore and its subsequent unveiling as a memorial to the sixty-nine sailors was the most visible outcome of the work. But the forensic results were of even greater interest to many family members, who really wanted to know what happened, why, and was there anything left of their loved ones to bring back.

Marci Sorg's detailed analysis of video and chemistry was quite conclusive. The summary of her report stated:

We conclude the bodies had a variety of postmortem histories and ultimate fates depending on their primary position in the vessel and subsequent exposure to currents and scavenging animals. It is very likely that the remains of most, probably all, of the men who died aboard the *Dakar* were lost, with no hope of postmortem recovery, at the time of the accident or soon thereafter, due to the implosion-explosion of the submarine while it was far above the sea floor. If any remains were initially preserved, shielded by the wreckage or by burial, these were very likely rare and incomplete. They would have been virtually impossible to locate in 1968 within the very large debris field

several kilometers in diameter. Now, after more than 30 years of exposure to biological and physical processes, it is very likely all of the remains have been re-incorporated into the natural environment, regardless of their immediate postmortem location or circumstances.

In less scientific terms, Marci was saying that today there is not a scrap of evidence that any physical remains are present. There was no direct or indirect evidence of human remains surrounding the submarine, within the debris field, or just inside the hull breaks. There was no indication of any sediment-covered masses that might include human remains. In fact, there was no evidence of any animal skeletal remains, human or nonhuman. On the other hand, there was lots of evidence that all remains had been consumed by the sea and its biological and chemical processes. Further, she believes that the bodies of the *Dakar* crewmen were shattered and dispersed by the energy of the implosion of the hull at the time of the sinking, and that recovery of any meaningful remains would have been unlikely even immediately after the sinking.

What about that hull implosion? Robin described the process, which is by no means fully understood. What we do know is that because the hull was designed to withstand fairly high pressures, which at a crush depth of around 650 feet approached 300 PSI, a huge amount of energy was built up and released all at once. In a matter of milliseconds, the interior space in the submarine hull was compressed to a fraction of its original volume, and the pressure instantly rose to, and past, the pressure of the water. In fact, the momentum of this pressure surge generated an overpressure, at least ten times the ambient sea pressure! Quicker than a blink, the atmospheric pressure inside the ship rose from normal conditions to many thousands of PSI, more than inside a fully charged scuba bottle! As with any compression of gas, the temperature rose, possibly to over 1,000 degrees Fahrenheit. A tremendous pressure shock wave rocketed through the hull, shattering metal and men, reducing a well-ordered technological wonder of a machine and her highly trained crew to a mess of twisted wreckage and broken bodies.

Just as quickly as the implosion crushed the hull, the massive overpressure was relieved in an equally energetic explosion, spewing the debris of the wreck out of the hull breaks and into the surrounding water. With energies equivalent to the detonation of tons of TNT, the rate of rise of strain and heat in the hull was so great as to cause random and erratic failures of both brittle and ductile nature. That is, the two-inch thick hull steel was twisted and extruded like taffy in some spots, and shattered like glass in others.

The evidence of such an event was clear from the photographic mosaic of the *Dakar* wreckage. Most of the 220-foot-long pressure hull was crushed beyond recognition. At the time of implosion, failures occurred at weak points

along the top of the hull, where the sail, hatches, hull penetrations, and other superstructure elements were attached. These points buckled inward, then blasted back out, rotating hull plates and equipment in unexpected ways. A section of hull appeared to have an unusual large pipe attached to it. This mystery was resolved when it was realized that the hull steel itself had been extruded into that pipe-like shape! The tail cone aft of the pressure hull separated completely, as did the forward section of the bridge fin, sliding neatly off the attack periscope and leaving it protruding naked from the rest of the wreckage of the control room. The bridge fin was probably ejected by a separate implosion-explosion of the ten-man diving chamber, of which no pieces could be found.

This event occurred high up in the water column, at less than one thousand feet, so the wreckage and its cloud of debris had another nine thousand feet or more to fall to the ocean floor. The heavy main hull section probably fell quickest, landing on what was left of its keel, gouging a crater and surrounded by clouds of billowing silt. The tail cone with its rudder, stern planes, and twin propellers landed askew next to the main hull, the pointed stern end aimed at what was left of the sail. The sail itself, less the four-ton forward piece containing the bridge, was twisted over on its side, still attached to the control room wreckage by a cluster bent antenna and mast tubes. The forward part of the bridge fin came to rest about two hundred yards from the main hull, surrounded by other bits of debris that rained down over the area.

A large motor-generator set, ejected from the stern section, landed neatly on the bow deck, looking as though it had been installed there deliberately.

Curiously, but most important, a significant length, over eighty feet, of the forward part of the pressure hull was completely undamaged. Including the bow sonar dome, anchors, and forward deck, this was the first part of the wreckage seen in 1999, giving the impression to Admiral Raz that the ship was still alive. Bow tanks, torpedo room, torpedo storage, and the front half of the accommodation compartment were completely whole and unscathed. Abruptly, at frame 59 (out of 132), the carnage of implosion-explosion began, and continued aft for the remainder of the pressure hull. The only explanation for this was that at the time of hull collapse those compartments were already full of water, and completely pressure compensated. This could only point to a massive flooding casualty in the bow of the ship.

Despite the state of the wreck, Robin and the team did their best to seek the clues they were looking for to support or refute the loss scenarios. Snorkel induction valves, exhaust valves, fan duct dampers, hatches, engine controls, battery vents, clutch positions, and many other specific pieces of equipment were sought and their condition noted. Many could not be found or seen clearly enough in the tangled mass of pipes, wires, and twisted metal. Nothing was in its place, and some items that were supposed to be at the bottom of the hull

were found near the top of the pile. But enough was discovered to be quite certain that the ship was submerged and snorkeling (snorting), and was likely in the process of securing from snorkeling, that is, preparing to dive deep. Robin concluded in his report:

It is disappointing to have to report that, due to the utter devastation of the control and engine rooms and the ravages of time which show as virtually total galvanic degradation of the aluminum structures still attached to the steelwork of the hull, the survey was unable to gain answers which might have given conclusive evidence as to the vessel's mode of operation and any emergency procedures in hand at the time of the loss.

No firm conclusions can be given as to the sequence and cause of the loss.

The following conclusions are therefore presented on the basis of an opinion as to the balance of probabilities:

The vessel was proceeding unhindered on her course to the Port of Haifa.

The vessel was most likely to be "snorting" or in the process of "stop snorting."

The vessel was subjected to a rapid and large volume of ingressed water perhaps into the torpedo storage space forward. This exceeded the buoyancy reserves.

The vessel pitched forward in a steep and rapid dive which could not be controlled by planes, propulsion, blowing tanks, or combinations of these.

Despite the best efforts of the crew the vessel exceeded her crush depth and the hull imploded-exploded catastrophically.

Robin added a footnote: "For the crew of the *Dakar* those last seconds before the hull collapsed would have been very busy with all together working as a team to try to save the vessel. When the end came it was instantaneous as if someone just turned off the light. TO THE UNDYING MEMORY OF THE MEN OF INS DAKAR."

Despite Robin's careful wording and unwillingness to speculate in an official capacity, the evidence of the *Dakar II* mission was quite clear. The ship did not suffer a collision, and was not attacked or damaged by hostile forces. There was certainly a massive hull breach in the forward part of the pressure hull, leading to uncontrollable and catastrophic flooding of the bow spaces. This probably occurred at the time the ship was securing from snorkeling and beginning a deep dive from periscope depth.

We don't know the speed of the ship at the time of the emergency, but it is safe to say that Captain Ra'anan was running fast most of the time. At an initial speed of eight knots at periscope depth, and assuming the tremendous weight of water flooding the forward compartments defeated any attempts to arrest an uncontrolled nosedive, the ship could have exceeded a collapse depth of around 650 feet in sixty-five seconds. There was no way to stop or even slow the descent. The *Dakar* crew had little time to realize what was happening, take immediate action, and combat the casualty before it was all over.

The source of the flooding is unknown; however, it had to be massive enough to fill over eighty feet of pressure hull in barely more than a minute. By the time collapse depth was reached, over ten thousand cubic feet of water had entered the hull, weighing close to four hundred tons. All of this weight was in the front of the ship, and nothing could have overcome the downward force, pitching the ship into a steep dive. To take in such a huge amount of water, there had to be a huge hole, probably the equivalent of eighteen inches or more in diameter, something like an open torpedo tube or failure of a major hull fitting. No such hole could be seen in the bow, although much of that section, including the torpedo tubes, was below the mud line.

A hole that size, under the pressure of seawater at the keel depth while snorkeling, would allow a massive slug of water to rush in the hull at a speed of thirty-five miles per hour. Over six thousand pounds of water would enter the ship in the first second, and the rate would increase as the ship dove deeper and the sea pressure rose. Any unfortunate crewman in that space would face the equivalent of being in the middle of a head-on collision between two automobiles, recurring again and again each second! No one in the torpedo room would survive such an onslaught, and crewmen in the accommodations section would probably have been knocked senseless by the shock of this deluge before they knew anything was happening.

The officer of the deck would have ordered immediate actions for combating a flooding casualty, including full rise on all planes and blowing of all ballast, but these measures would have been ineffective. As Robin Williams so aptly stated, after a matter of seconds, the lights switched off.

☆☆☆

I have told the story of the *Dakar* as I know and lived it, as accurately as I could. For many of you, the story should end here. But many may want to know more. What exactly happened in those final moments, and how did the men of the *Dakar* cope with their fate? Of course, we can never know for sure. But we can drape the bare facts with possibilities, based on experience and a little imagination.

There are those who are uncomfortable with any discussion beyond the facts, including the Israeli Navy, so I must make it perfectly clear that what follows is purely my own invention. However, it does not require a flight of fancy or wild speculation to imagine what must have been happening to Captain Ra'anan, Isaac Marcovici, Boomie Barkay, and the rest of the sixty-nine crewmen in those final sixty-five seconds of the voyage of the INS *Dakar*. For those who care to join me, I invite you to continue.