Flounder One

Lt. Pat McCormick

After four months of Operation Enduring Freedom flights, our five-hour missions had become routine, and we weren't dropping ordnance. Each day was Groundhog Day, with similar kneeboard cards, short briefs, routes, tankers, and debriefs in CVIC. The comfort level was high enough that non-section leads were allowed to lead missions over Afghanistan, with a designated mission commander as a wingman.

The launch, join-up, S-3 tanking, and transit feet dry were uneventful. We arrived at a KC-135 about 20 minutes before sunset, our first scheduled tanker in country. I had finished tanking and was waiting for my wingman to gas when I got a hyd 2A caution. We detached from the tanker, turned south toward mom, and decided to make the next scheduled recovery.

The FA-18 hydraulic system is composed of two separate systems, hyd 1 and hyd 2; each has two circuits, A and B. System 1 exclusively provides power to the primary flight controls. System 2 powers the primary flight controls, the speed brake, and non- flight-control items (the hook, refueling probe, nosewheel steering, anti-skid, normal brakes, and the landing gear). Five isolation valves prevent a hydraulic leak in an accessory system from draining fluid or pressure from the flight-control actuators. A reservoir-level sensing (RLS) system detects leaks in the system and tries to isolate the failed circuit by systematically shutting it off.

My wingman and I started to read the PCL. The hyd 2A caution was confirmed with the failure of the refueling probe to normally extend. There was no reason to jettison my single 1,000-pound JDAM, but we eventually

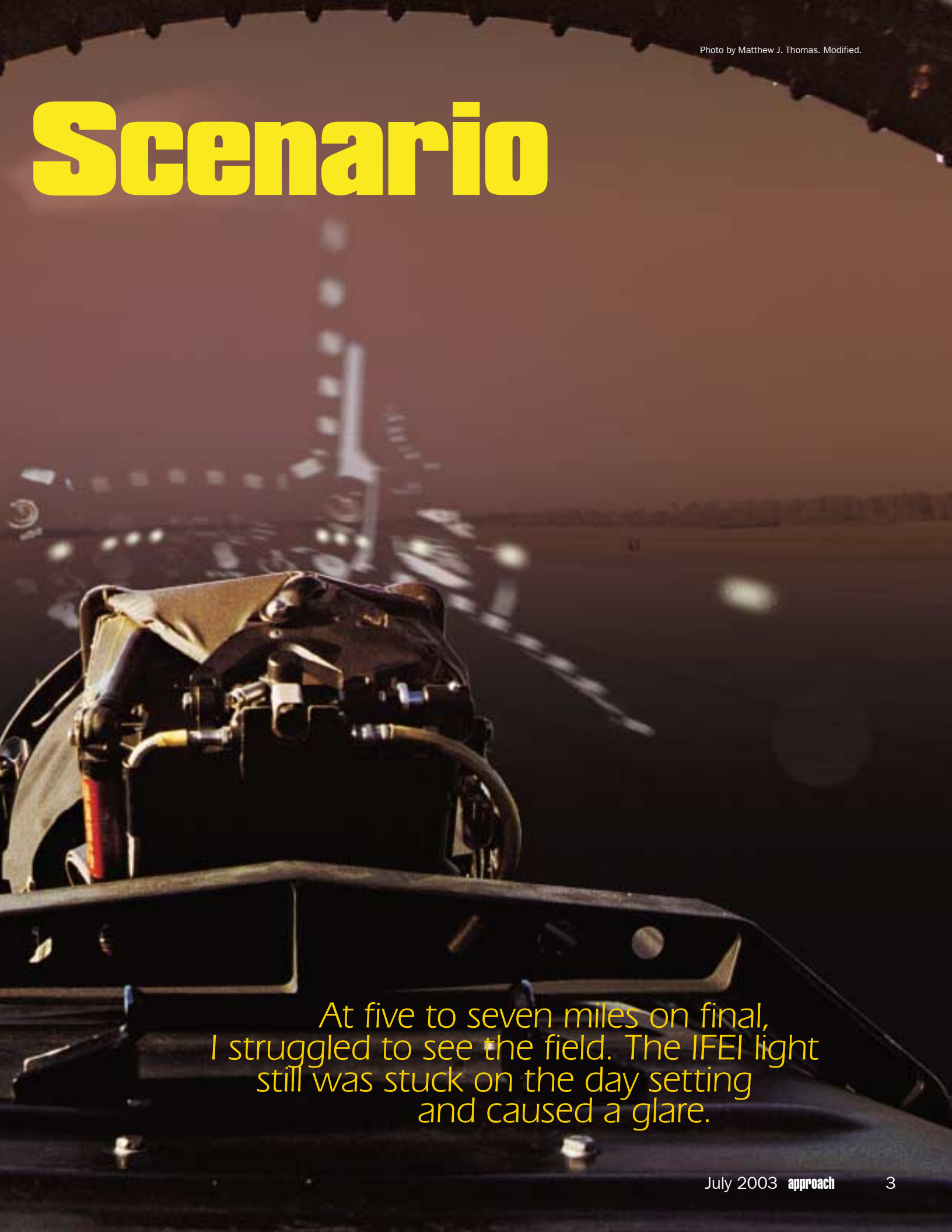

Photo by Matthew J. Thomas. Modified.

Scenario

At five to seven miles on final, I struggled to see the field. The IFEI light still was stuck on the day setting and caused a glare.

would have to emergency extend the landing gear. Twenty minutes later, I got a hyd 1A caution, with an ail-off caution, and the right aileron X-ed out—in addition to the hyd 2A caution.

Unfortunately, the PCL does not address procedures for the 1A and 2A caution combination, other than a schematic of the lost flight controls. We declared an emergency and headed directly to the ship. The ship was 35 minutes away, while Jacobabad, Pakistan, was only 25 minutes away. It would be dark by the time we reached either. My wingman and I felt the combination of arresting gear, LSOs, instrument approaches, and having the jet back on the ship were worth the extra few minutes. The E-2 tried, unsuccessfully, to coordinate a transit through Iranian airspace, so we had to alter course.

Fifteen minutes later, the hyd 1A caution cycled to hyd 1B. My left digital-display indicator (DDI) cautions indicated: hyd 1B, hyd 2A, ail off, flaps off, rudder off, FCS, FCES, with no leading-edge flaps, right aileron, right rudder, or right stabilator. This hydraulic-failure combination also is not covered in the PCL, other than the flight-control-system-failure schematic.

I made a radio call, saying I was losing control. I considered ejecting because I was sure the jet would tumble once it left the pavement.

My wingman already had confirmed hydraulic fluid was streaming from the root of the left wing. I worried if the system was cycling to isolate the leak on the system 1 side. It might only be a matter of time before all the fluid was gone, and I would lose both 1A and 1B. The hyd 2 system might have a similar leak, but it hadn't cycled yet. I also wasn't going to count on hyd 2.

In case I had to eject, I tightened my straps, put the extra water from my helmet bag into my G-suit, and stowed everything in the cockpit. We immediately turned for Jacobabad, not wanting to bring this configuration to the ship at night. With the leading-edge flaps failed, the approach speed would be higher, and the jet would have to be flown at less than seven degrees angle-of-attack, rather than on-speed. My wingman coordinated with the controlling agencies, while I looked up each caution in the PCL and thought about landing in Jacobabad.

At 80 miles from the field, I noticed several electrical irregularities. The integrated fuel and engine-instrument (IFEI) panel would not dim to the night setting. Heading pointer or navigational queuing was not displayed in the heads-up display (HUD). Additionally, the system would not waypoint designate a point in the air-to-ground master mode.

When I was 50 miles out, I erased all classified data from the JDAM and jet. My wingman briefed the field layout, elevation, runways, MSA, ESA, as well as the approach we would make to minimize the chance of taking ground fire (Jacobabad had been attacked with rockets just weeks earlier). He also coordinated with the tower for crash crews. We turned off our position lights, and I kept on my formation lights but very dimly. We also went through the NATOPS procedures for the flaps-off caution with failed leading-edge flaps. I would need to stay below seven AOA on the approach.

At 10 miles from the field, the hyd 1A caution came back on. The left DDI now showed hyd 1A, hyd 1B, hyd 2A, FCS, FCES, ail off, flaps off, and rudder off. The FCS page showed the LEF, right aileron, right rudder, and right stabilator still all failed. This pattern agreed with the PCL's diagram for these hydraulic failures. We crossed the field at 1,500 feet, perpendicular to runway 15 to get a look at it.

I made an easy left turn to downwind and talked through the emergency-gear-extension procedures. With the gear down, the aircraft

handling significantly degraded, resulting in altitude deviations from the 1,200 feet we tried to maintain. At one point, I got down to 900 feet and received a "watch your altitude" call from my wingman.

At five to seven miles on final, I struggled to see the field. The IFEI light still was stuck on the day setting and caused a glare. My wingman talked my eyes onto the field; I noticed the HUD instrumentation was not all present. The AOA indication was intermittent, even with the velocity vector outside the E-bracket, and the digital VSI was missing.

Just two miles from touchdown, two of my displays, the left DDI and MPCD, flashed and went blank as mission computer 1 failed. I brought the HUD up on the right DDI but now would have limited warnings-cautions. Jacobabad's runway 15 did not have a glideslope indicator or centerline lighting. I stayed below seven AOA until I felt deck rush, as I sank between the runway-edge lighting. I had a difficult time determining when I would touch down, and the lack of VSI didn't help. Flying fast without an AOA indication made me feel the nose would hit first; however, I was unsure of the controllability if I flew on-speed or tried to reduce my VSI near touchdown by flaring.

I touched down near the eight board at over 150 knots and took one large hop before the jet settled onto the runway. The jet tracked fairly straight and seemed controllable. Just before the five board, I made sure the pressure was off the brakes and pulled the emergency-brake handle. The aircraft immediately swerved hard to the right at about 105 knots. I used rudder, stick, and brakes to keep the jet from sliding sideways or departing the runway.

I made a radio call, saying I was losing control. I considered ejecting because I was sure the jet would tumble once it left the pavement. I didn't pull the handle because at the rate the jet was swerving, it might be off the pavement and tumbling when the seat fired. After the corrections, the jet tracked back across the runway to the left side. I corrected back to the right and did the same one more time to the left. The aircraft stopped near the four board. I told my wingman I was safe on deck.

My left main gear indicated a planning-link failure, with a flashing light and gear tone. It turns out the left main wheel was bent sideways 20 degrees from the side forces during the swerving.

Although I was safe on deck, our problems were not over. My aircraft could not be towed from runway 15—the only runway—because the ground crew did not have a tow bar that fit the Hornet. My wingman had enough fuel to orbit for 30 to 45 minutes before he would be forced to land on a taxiway. Bluetail (an E-2C) had relayed the events to CVIC, where our CAG and squadron CO were listening. They already had contacted our Navy-liaison officer at the combined-air-operations center in Saudi Arabia to get a tanker moving our way. My wingman plugged with a 1.9 and returned to the ship for a night trap.

The investigation determined the electrical-hydraulic valve on the hydraulic-drive unit that actuates the leading-edge flaps had failed. The valve leak allowed the fluid from hyd 1B and 2A to drain out of the jet. The mission computer (MC) 1 failure appeared to be independent and could account for loss of instrumentation and electrical oddities. The maintenance data showed the right aileron worked after hyd 1A cycled to hyd 1B, although the FCS X never cleared. The MC 1 failure may have accounted for Xs not clearing and for hyd 1A caution returning, although the 1A circuit appeared to be working. MC 2 failed on start the next day when maintenance began repair work.

From looking at the tire marks, the jet touched down between the nine and eight boards, and the tire skid marks started between the six and five boards. After less than 50 feet, there were two marks where both tires exploded, followed by over 1,000 feet of skid marks going back and forth across the runway up to where the jet stopped.

Three circuit-hydraulic failures nearly are unheard of in the FA-18, and that, combined with an MC 1 failure, could be a first. Several points are worth discussing, along with possible changes to our PCL and procedures.

The Hornet community long has been aware of a tendency to blow tires when using the emergency brakes. Our simulators do not accurately simulate blown tires or the emergency brakes. A blown tire in the simulator is benign, while a blown tire at high speed in the jet can be violent and uncontrollable. The simulators should be corrected to allow realistic training.

Pilots should give serious thought to the risks involved with using the emergency brakes at high speed. With a reasonable chance of blowing a tire, should you wait to use the emergency brakes until you're below a speed where the jet won't flip if a tire blows and you depart the runway? If so, what is that speed, and should it be quantified with an additional warning-caution in NATOPS? The obvious risk here, depending on runway length, is not stopping and going off the end of the runway but at a much lower speed.

The PCL should be updated to include procedures for each combination of hydraulic-circuit failures. There are only 14 possible combinations.

From the in-flight-engine-condition-monitoring-system (IECMS) data, the erasing of the classified JDAM data exactly looked like an FCS reset. Does it command the same reset? Be aware that NATOPS states an FCS reset with an LEF failure may aggravate a split-flap position.

Also, consider who should land first in a situation like this. Had a tanker not been available, risk would have increased for another mishap if my wingman had been forced to land wherever possible.

Ultimately, sound decision-making and good crew coordination got the jet on deck with minimal damage. Maintenance got the jet back on the ship in less than 48 hours. Flying in a hostile and unknown area, with so few divert fields without arresting gear, is rare. Flying under these conditions with major multiple emergencies is even more rare. When you fly around the ship, carefully consider bringing a failing aircraft into a hostile, unfamiliar field at night, without all the familiar amenities: instrument approaches, familiar controllers, centerline lighting, and arresting gear.

Lt. McCormick flies with VFA-131.