

## Go Back To "Go"

While Gemini VII had rested on pad 19 awaiting launch, welders and repairmen had stood by. Borman and Lovell had barely started their booster-chasing exercise when Elliot See told them that pad cleanup had begun. The normal feeling of anticlimax after a launch was absent. If anything, spirits may have seemed too high. "Everybody was so excited you'd think they were going to launch the next day," John Albert recalled. The Martin crew found minimal damage to pad 19. Workmen wasted little time on normal painting or cleaning. Their objective was to replace critical instrumentation.

The launch team got GLV-6 up and the spacecraft mated to it in one day, complete with standard procedures, tests, and reviews. In addition, *VII's* radar transponder was interrogated as Borman and Lovell passed over Cape Kennedy to ensure that it would answer *VI's* radar transmissions.<sup>54</sup>

[283] After 56 hours of the Borman-Lovell mission, rapid progress in getting Gemini VI-A ready fostered hopes that it might fly on the eighth instead of the planned ninth day. A computer problem dampened these hopes briefly, but, with a new part installed, the final simulated flight test started and ended without problems. On 9 December, Mathews and Funk were convinced that the launch could be made a day early.<sup>55</sup>

On Sunday, 12 December, Astronauts Schirra and Stafford moved through the doors and into the couches of Spacecraft 6 for a second time. After a troublefree countdown, precisely at 9:54 a.m., their Gemini launch vehicle roared into action. The roar was quickly strangled. *Gemini II's* "hold-kill" seemed to be repeating, but this time more critically - there were two men strapped atop this sputtering rocket. At 1.2 seconds, an electrical tail plug dropped from the base of the booster and activated an airborne programmer - a clock in the cockpit that was not supposed to start until the vehicle had lifted off. Because there had been no upward movement, the valves closed to prevent fuel front gushing into the launch vehicle's engines. The malfunction detection system had sensed something wrong and had stopped the engines.<sup>56</sup>

One of the most suspense filled moments in the whole Gemini program followed. If ever there were a time to use the spacecraft ejection seats to get away from a cocked and dangerous rocket, this seemed to be it.

Kenneth Hecht, chief of the Gemini Escape, Landing, and Recovery Office and long-time ejection seat specialist, was surprised when the crew did not eject, as they should have if ground rules had been strictly followed. If the clock were right, then the vehicle had left the ground. Had it climbed only a few centimeters, the engine shutdown would have brought 136 tonnes (150 tons) of propellants encased in a fragile metal shell crashing back to Earth. There could be no escape from the ensuing holocaust. But neither Schirra nor Stafford had sensed motion cues; and Schirra, who as command pilot would have been the one to pull the "D-ring" for ejection, decided not to, despite the ticking clock.

At the moment of crisis, the veteran test pilot remained calm. With no trace of emotion in his voice, Schirra reported, "Fuel pressure is lowering." Francis X. Carey, the Martin launch vehicle test conductor, was just as matter of fact over the radio circuit to the spacecraft. Just a hint of panic might have caused Schirra or Stafford to pull the D-ring. Schirra relied, with icy nerves, on his own senses. He knew GLV-6 had not moved, and he knew the clock was wrong.<sup>57</sup>

When the smoke had cleared and it appeared that the booster was not going to explode after all, up went the erector. Guenter Wendt and his McDonnell team hastened back to the white room they had so recently left. After checking on the cabin pressure and making sure that [284] the crew had safetied the seat pyrotechnics, Wendt opened the hatches and helped the astronauts, their faces etched with disappointment, out of the spacecraft.<sup>58</sup>

Seamans had been listening in at NASA Headquarters in Washington. Once sure that the crew was safe, he went home. A call from Administrator Webb soon brought word that President Johnson was greatly disturbed by the failure. All was not lost, Seamans told Webb. *Gemini VII* still had six days in orbit - time enough, he hoped, to find the source of trouble and launch VI-A for the rendezvous.<sup>59</sup>

The Martin and Air Force teams began recycling the booster for a launch to take place four days later. So far as they knew, the only thing wrong was a tail plug that had fallen out prematurely. A check through the records left no question that the plug had been properly twisted into its detents. But testing revealed that some plugs did not fit as tightly as others and pulled out more easily. (The harder-to-remove plugs, with a safety wire added, became standard for Gemini.)<sup>60</sup>

As expected, reporters clamored for details about the engine shutdown. Merritt Preston was picked to tell them what NASA knew and what it planned to do. Known to the press as a spacecraft expert, Preston could not be expected to know all the technical details about the launch vehicle and would be saved from having to guess. Although he winced at being placed on the firing line, his explanations at a news conference were well received and he was not pressed for answers. Reporters shared with Gemini officials the belief that it was just a case of a plug pulling out. The malfunction detection system had worked as it should, the crew had remained cool. There seemed every reason to believe that the launch could take place in four days.<sup>61</sup>

Aerospace engineers routinely examined the launch vehicle engine thrust-trace data. The firing trace looked normal at the beginning, but some strange squiggles farther along on the graph suggested that thrust had decayed *before* the plug dropped out. A call to John Albert caught him as he was leaving for a meeting to discuss plans for the launch turnaround. He detoured to get a copy of the graph, which he took to the meeting. A telephone call was immediately placed to the Aerojet-General plant in Sacramento. A detailed analysis tentatively spotted the problem in the vicinity of the gas generator. But the trouble itself needed to be pinned down. By 7 o'clock that evening - 12 December - the Cape Aerojet engineers were searching the engine, piece by piece. All through the night they worked, but to no avail. When Charles Mathews came by at 9:00 the next morning, their haggard and worried faces told him there had been no success. Just as he was asking what Aerojet intended to do now, an excited engineer came running in, shouting that he had the answer - a dust cover that had accidentally been left in the engine. Months before, in the Martin Baltimore plant, the gas generator had been removed for cleaning. [285] When the check valve at the oxidizer inlet was taken off, Martin technicians put a plastic cover in the gas generator port to keep dirt out. Later that dust cap was overlooked when the unit was reinstalled. The relatively inaccessible location of the check valve - on top of the engine just under the tankage where it could not be seen and all work had to be done using mirrors and touch effectively prevented the errant cap from being discovered.<sup>62</sup>

Once the trouble was found, the gas generator was cleaned and replaced in GLV-6 on 13 December. It had suffered no damage, but a question still lingered: Could VI-A be launched in time to rendezvous with VII? At the time of the hangfire, recycling was expected to take four days, but within five hours of the failure, Elliot See told the *Gemini VII* crew that launch was targeted for the third day - 15 December<sup>63</sup> - with a mighty effort to reduce the 96-hour recycle to 72 hours. It succeeded.<sup>64</sup> The friendly target was still waiting patiently upstairs.

One question remained unanswered and unanswerable. When Schirra refused to pull the D-ring that would have ejected the Gemini VI-A crew, was that a decision he alone would have made, or was that an indication that none of the astronauts would have used the seats? \* The feelings expressed by the only Gemini pilots who faced that decision leave a measure of doubt.

Stafford's concern was the enormous acceleration - more than 20 g's - an off-the-pad abort required to throw the seat in a stable trajectory far enough from the booster to do any good. Even a mentally prepared astronaut might suffer severe injury. At best, Stafford believed, he would have been walking around for months with a crick in his back, like those who had ejected in similar high-impulse Martin-Baker seats. Of course, he would also be alive. And Schirra remarked. "If that booster was about to blow . . . if we really had a liftoff and settled back on the pad, there was no choice. It's . . . death or the ejection seat."<sup>65</sup>

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\* Early in the program, some thought was given to training Gemini crews on an ejection seat catapult at the Navy's aircrew training laboratory in Philadelphia. When a Navy test subject tried the facility and reported that it was no worse than being catapulted in a plane off a carrier, MSC officials decided it was not worth the effort. Warren J. North, Chief of the Flight Crew Support Division, said that "generally speaking, the flight crews were all in favor of the

ejection seats," in spite of the extremely high g forces.

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54 Albert and Verlander interviews; "Gemini VII Voice," I, pp. 6, 136; Kleinknecht, "Daily Report No. 1," p. 13; Alexander C. Kuras and John G. Albert, "Gemini-Titan Technical Summary," 24 Jan. 1967, pp. 144-45; TWX, Mathews to McDonnell, Attn: Burke, "Contract NAS 9-170, Gemini, Need for Radar and Transponder for Tests at the Cape," GP-7392, 5 Nov. 1965; memo, Mathews to Asst. Dir., Flight Crew Ops., "Rendezvous radar transponder test for the Gemini VII mission," GV-66279, 27 Nov. 1965.

55 "Gemini VII Voice," I, pp. 178, 183; Kleinknecht, "Daily Report[s] No. 2," pp. 11, 12, "No. 4," GT-11122, 8 Dec. 1965, "No. 5," pp. 13-14; "Gemini VI-A Mission Report," p. 12-21.

56 TWX, Kleinknecht to NASA Hq., Attn: Webb, and MSC, Attn: Gilruth, "Daily Report No. 8," GT-11127, 13 Dec. 1965, pp. 15-16; Wambolt and Anderson, "Launch Systems Final Report," p. II.E-19; Kuras and Albert, "Gemini/Titan Technical Summary," p. 145; John J. Williams, interview, Cape Kennedy, Fla., 24 May 1967; memo, Mueller to Adm., "Gemini VI-A Mission, Post Launch Report No. 1," 23 Dec. 1965, with enclosure, subject as above, M-913-65-08, same date.

57 Kenneth F. Hecht, interview, Houston, 23 Feb. 1967; Howard Simons, "Reset for Wednesday: Plug Trouble Delays Gemini 6 Liftoff," *The Washington Post*, 13 Dec. 1965; Verlander interview; Eugene F. Kranz, interview, Houston, 28 April 1967; Simpkinson, interview, Houston, 18 Jan. 1967; "Gemini VIA Post Launch Report No. 1," p. la; [Gemini 7/6] mission commentary transcript, 12 Dec. 1965, tape 339, p. 2.

58 "Gemini VI Debriefing," p. 251; Wendt interview.

59 Seamans letter, 30 July 1969.

60 "Gemini VI-A Post Launch Report No. 1," p. la; Albert interview; Kleinknecht, "Daily Report No. 8," p. 16.

61 Preston interview; "Gemini 6 Scrub Press Conference," 12 Dec. 1965.

62 Hohmann, interview, El Segundo, Calif., 19 April 1966; Albert interview; Maj. Gen. Ben I. Funk, interview, Sunnyvale, Calif., 12 March 1967; E. Douglas Ward and Louis D. Wilson, interview, Sacramento, Calif., 30 June 1966; Lt. Col. Fountain M. Hutchison and Capt. Howard T. Harris, interview, Los Angeles, 19 April 1966; Haggai Cohen, interview, Baltimore, 24 May 1966; Bastian Hello, interview, Baltimore, 23 May 1966; Kleinknecht, "Daily Report No. 8," pp. 16-17; Wambolt and Anderson, "Launch Systems Final Report," p. II.E-19; Kuras and Albert, "Gemini-Titan Technical Summary," p. 145; Hohmann letter, 12 Aug. 1969; "Gemini VI-A Post Launch Report No. 1," p. la; letter, Hutchison to MSC Historical Office, 11 Aug. 1969; Hammack, telephone interview, 2 March 1973.

63 Kleinknecht, "Daily Report No. 9," p. 12; Hutchison and Harris interview.

64 "Gemini VII Voice," II, pp. 560, 585, 647, III, pp. 738, 750, 751; Kuras and Albert, "Gemini-Titan Technical Summary," pp. 145, 146; "Launch Operations Techniques, Manned Space Flight," Gemini Launch Vehicle Div., 6555th Aerospace Test Wing, 22 Dec. 1966, p. 168.

65 Schirra interview; Thomas P. Stafford, interview, Houston, 3 April 1967; Warren J. North, interview, Houston, 10 Jan. 1967.

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