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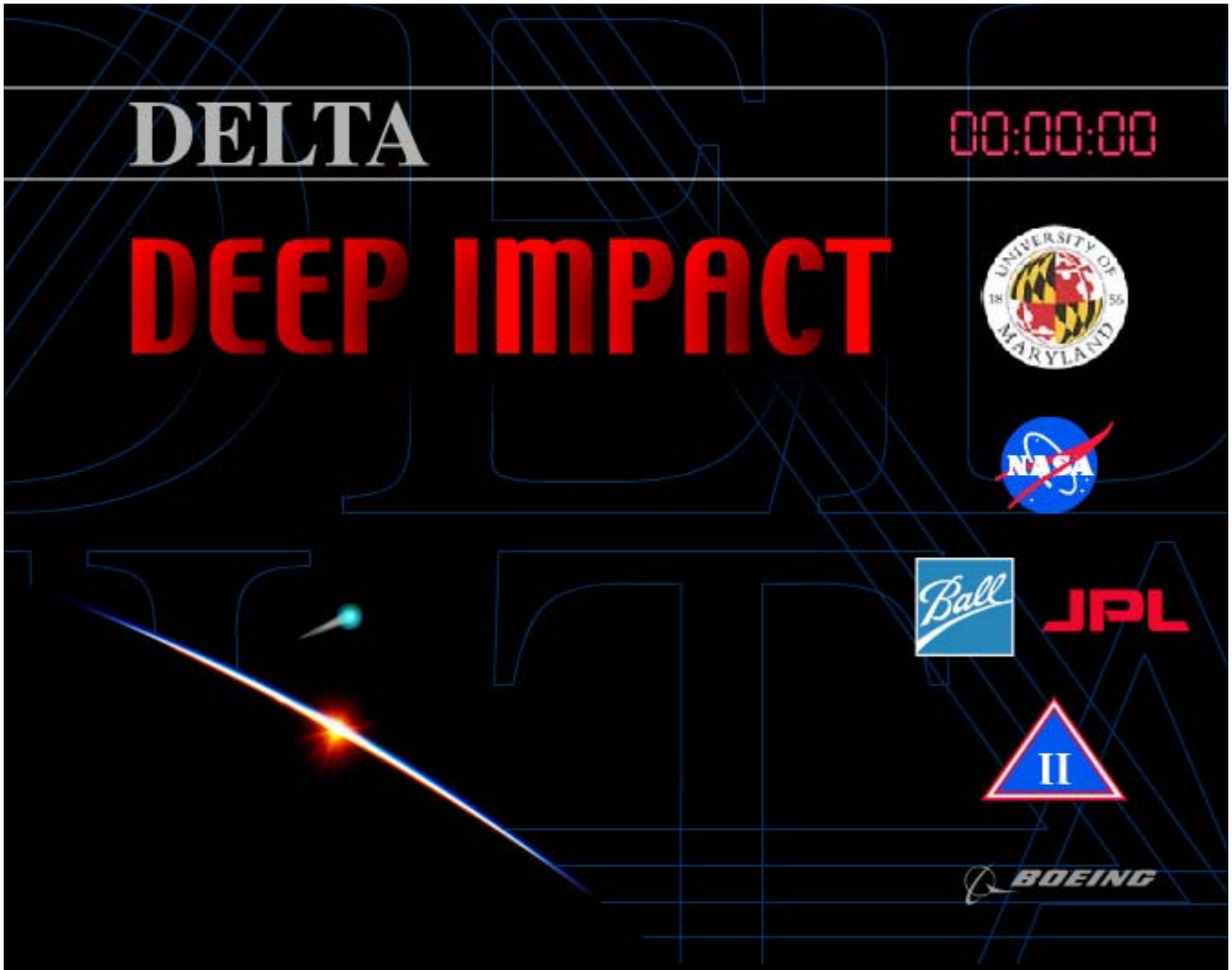

Media Kit

This site requires a JavaScript-enabled browser and uses Flash for both animation and navigation. To get the full benefit of the Boeing Web Site, you will need to download and install the latest version of the Flash player, then return to view the site.

You can still view a non-Flash web page by clicking on the links below.

- Delta Launch Videos
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MISSION INFORMATION

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Boeing Delta II
Space Launch Complex 17

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Delta Launch Vehicle

Delta II 7925 Launch Vehicle and Deep Impact

PHOTO GALLERY

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Previous Scientific missions

Swift, 20 November, 2004
A Boeing Delta II rocket launched NASA's Swift observatory, which will monitor gamma-ray bursts believed to accompany the formation of black holes in space. Swift was launched by a Delta II 7320-10C vehicle. Lift-off occurred at 12:17 p.m. EST from Space Launch Complex 17A, Cape Canaveral Air Force Station, Fla.

Gravity Probe-B, 20 April, 2004
Gravity Probe B, a NASA satellite that will validate two key aspects of Einstein's general theory of relativity, was launched today aboard a Boeing Delta II rocket. The Delta II lifted off at 9:57:24 a.m. PDT from Space Launch Complex 2W at Vandenberg Air Force Base, Calif.

MER-A, 10 June, 2003
A Boeing Delta II rocket successfully delivered to space NASA's Mars Exploration Rover-A, also named *Spirit*, that launched at an instantaneous window of 1:58:47 p.m. EDT from Space Launch Complex 17A, Cape Canaveral Air Force Station, Fla. The rover landed on Mars in early January, 2004.

MER-B, 7 July, 2003
Opportunity, the second of two NASA rovers that will land on Mars, was launched by a Boeing Delta II launch vehicle from Space Launch Complex 17B, Cape Canaveral Air Force Station, Fla. Liftoff occurred at 11:18:15 p.m. EDT. Approximately 80 minutes into the flight, *Opportunity*, or Mars Exploration Rover (MER)-B, was deployed in its proper trajectory and landed on Mars Jan. 25, 2004.

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LINKS

Boeing Delta Launch Vehicles

NASA (customer)

Deep Impact Home Page

Deep Impact

Delta Launch Vehicle Programs

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Deep Impact Science Objective

Comets are time capsules that hold clues about the formation and evolution of the solar system. Their nuclei are composed of ice and dust, which are debris from the solar system's earliest and coldest formation period – 4.5 billion years ago. It is the evaporation of the ice into gas and the dragging of dust by the gas that makes the head and tail of the comet we normally see.

While several spacecraft have observed the exterior of comets, none have penetrated the surface to answer the fundamental question, "What's deep inside?" **Deep Impact**, a NASA Discovery Mission, is the first space mission to probe beneath the surface of a comet and reveal the secrets of its interior.

Deep Impact Science Objective (continued)

Tempel 1, the target comet for **Deep Impact**, was discovered in 1867 by Ernst Tempel. It has made many passages through the inner solar system, orbiting the Sun every 5.5 years. This makes Tempel 1 a good target to study evolutionary change in its mantle, or upper crust. Comets are visible for two reasons. First, dust driven from a comet's nucleus reflects sunlight as it travels through space. Second, certain gases in the comet's coma (the cloud of dust and gas particles surrounding the nucleus), stimulated by the Sun, give off light like a fluorescent bulb. Over time, a comet may become less active or even dormant. Scientists are eager to learn whether comets exhaust their supply of gas and dust to space or seal it into their interiors. They would also like to learn about the structure of a comet's interior and how it is different from its surface. Deep Impact and its excavation of Tempel 1 will help provide answers to these questions.

Deep Impact Spacecraft and Science Instruments

A day before intercept, **Deep Impact** will deploy a 370-kg (~820-lbs) **impactor** spacecraft into the path of the onrushing comet. The **impactor** is a battery-powered spacecraft that operates independently of the main **flyby** spacecraft for just one day. It is called a “smart” **impactor** because, after its release, it takes over its own navigation to maneuver into the path of the comet and select an aim point on the sunlit side. A camera, known as the impact targeting sensor, in the **impactor** captures and relays images of the comet’s nucleus just seconds before collision. The comet, traveling at 29.9 km/sec (66,900 mph) will actually overtake the **impactor** at a relative velocity of 10.2 km/sec (22,800 mph).

A divert maneuver after **impactor** release will put the **flyby** out of harm’s way, to observe the impact with its medium and high resolution imagers. The **flyby** will transmit its own observations as well as relay video from the **impactor** to Earth.

Ice and dust debris will be ejected from the crater revealing fresh material beneath. Sunlight re ecting off the ejected material will provide a dramatic brightening that will fade slowly as the debris dissipates into space or falls back onto the comet.

The impact is not forceful enough to make an appreciable change in Tempel 1’s orbital path around the Sun. However, it will lead to a better understanding of both the solar system’s formation and implications of comets that may collide with Earth in the future.

Deep Impact Spacecraft and Science Instruments

Deep Impact
(shown in fairing)

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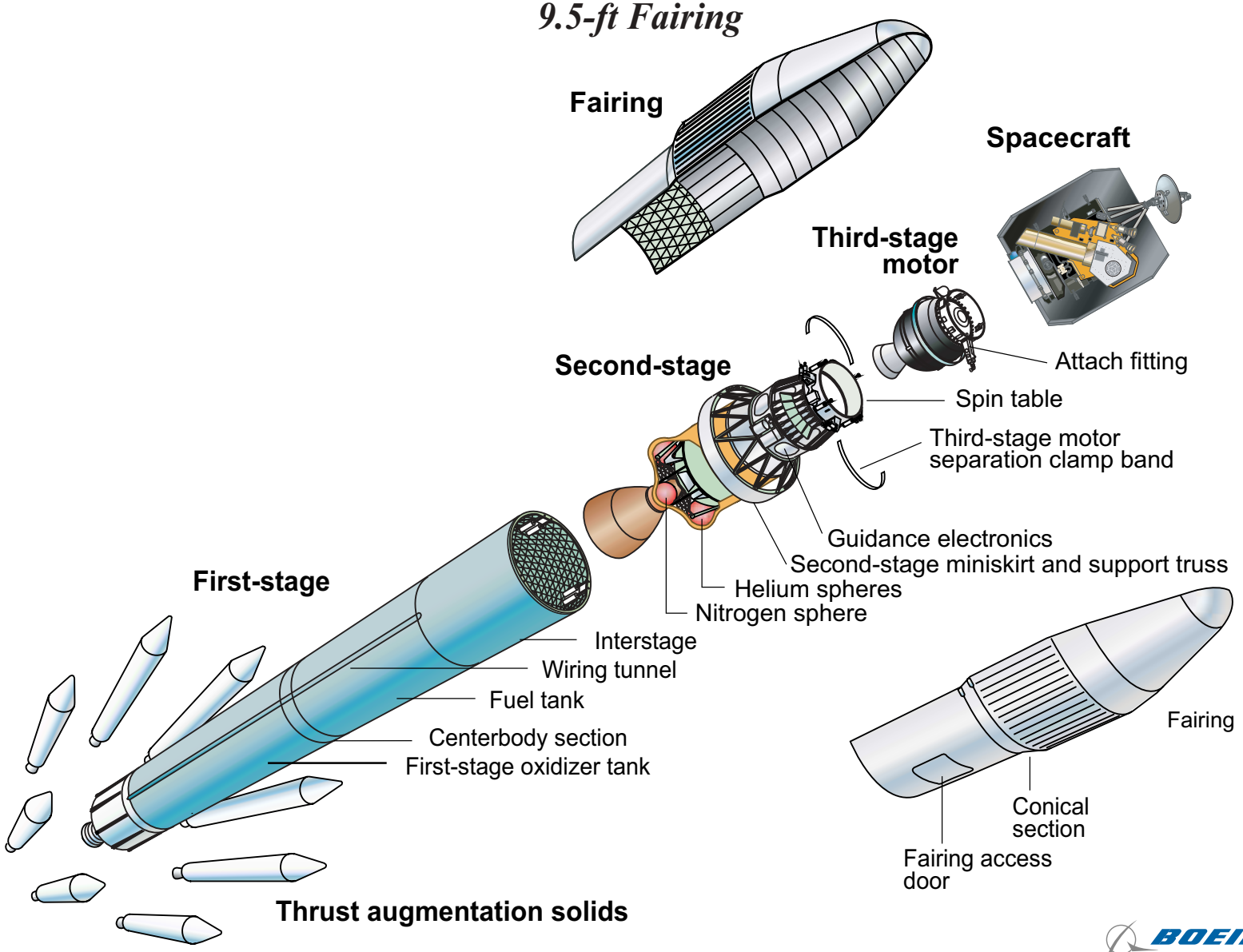
Deep Impact Mission Description

- Launch period: 08 to 28 January 2005
- Launch times for 08 January
  - First opportunity (95º launch azimuth): 13:08:29 EDT
  - Second opportunity (101º launch azimuth): 13:48:04 EDT
  - Launch time averages ~7 minutes earlier each day of the period
- Spacecraft mass: 976 kg (2151.7 lb)
- Injection conditions for 08 January launch (95º azimuth)
  - Altitude: 982.8 nmi
  - Velocity: 34,110.6 fps
- Comet Impact: 11:08 pm PDT, 3 July 2005

Delta II 7925 Launch Vehicle

9.5-ft Fairing



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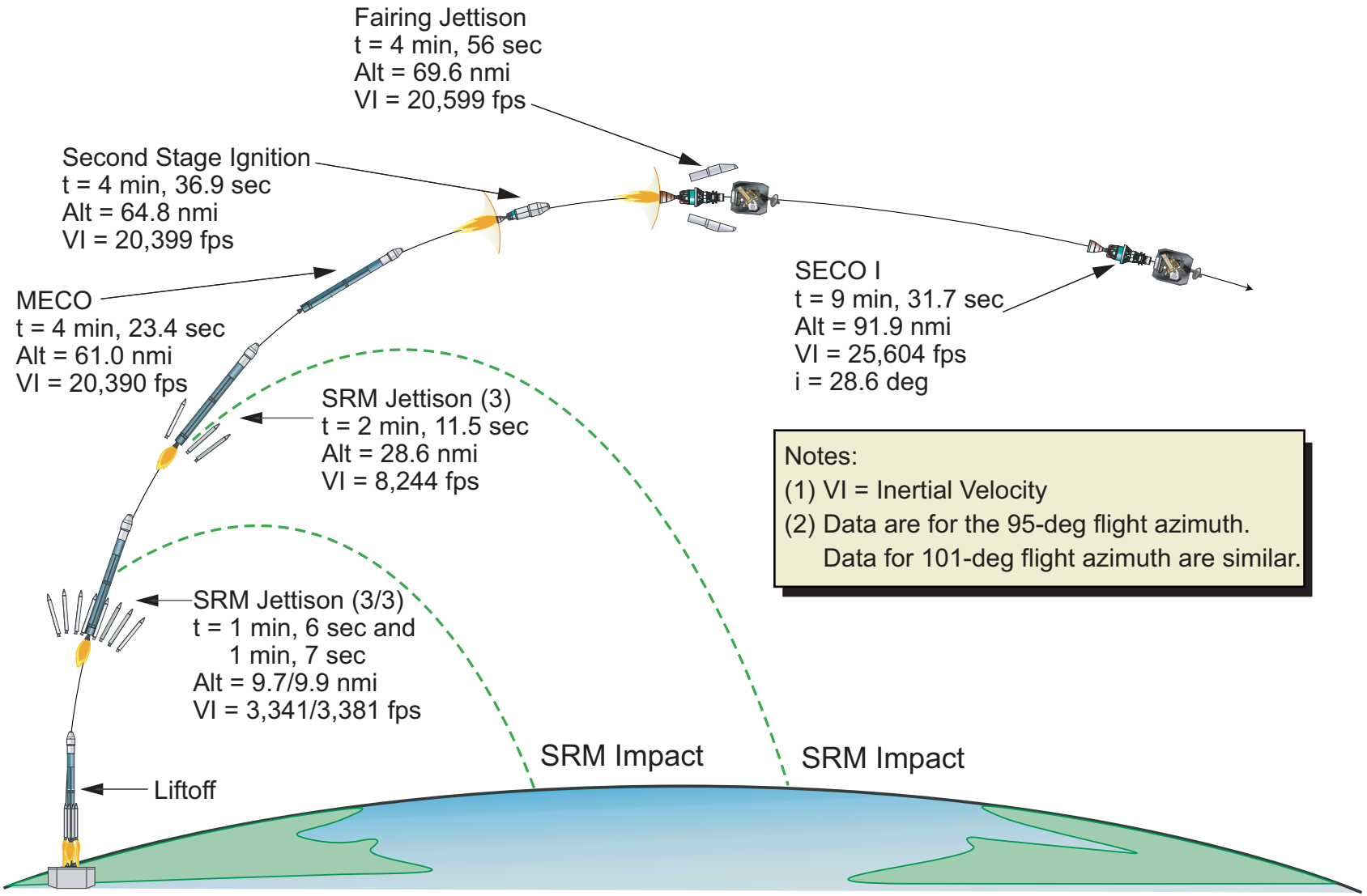
Deep Impact Boost Sequence of Events

Event	95-deg Time (min/sec)	101-deg Time (min/sec)
Liftoff	0:00.0	0:00.0
Mach 1	0:32.4	0:32.4
Maximum Dynamic Pressure	0:49.8	0:49.8
6 Solid Motors Burnout	1:03.1	1:03.1
Air Lit Solid Motor Ignition (3)	1:05.5	1:05.5
Jettison 3 Solid Motors	1:06.0	1:06.0
Jettison 3 Solid Motors	1:07.0	1:07.0
Air Lit Solid Motor Burnout	2:08.8	2:08.8
Jettison 3 Air Lit Solid Motors	2:11.5	2:11.5
Main Engine Cutoff (MECO)	4:23.4	4:23.4
Stage I-II Separation	4:31.4	4:31.4
Stage II Ignition	4:36.9	4:36.9
Jettison Fairing	4:56.0	4:56.0
First Cutoff - Stage II (SECO-1)	9:31.7	9:32.4

Deep Impact Boost Profile



Notes:
(1) VI = Inertial Velocity
(2) Data are for the 95-deg flight azimuth.
Data for 101-deg flight azimuth are similar.

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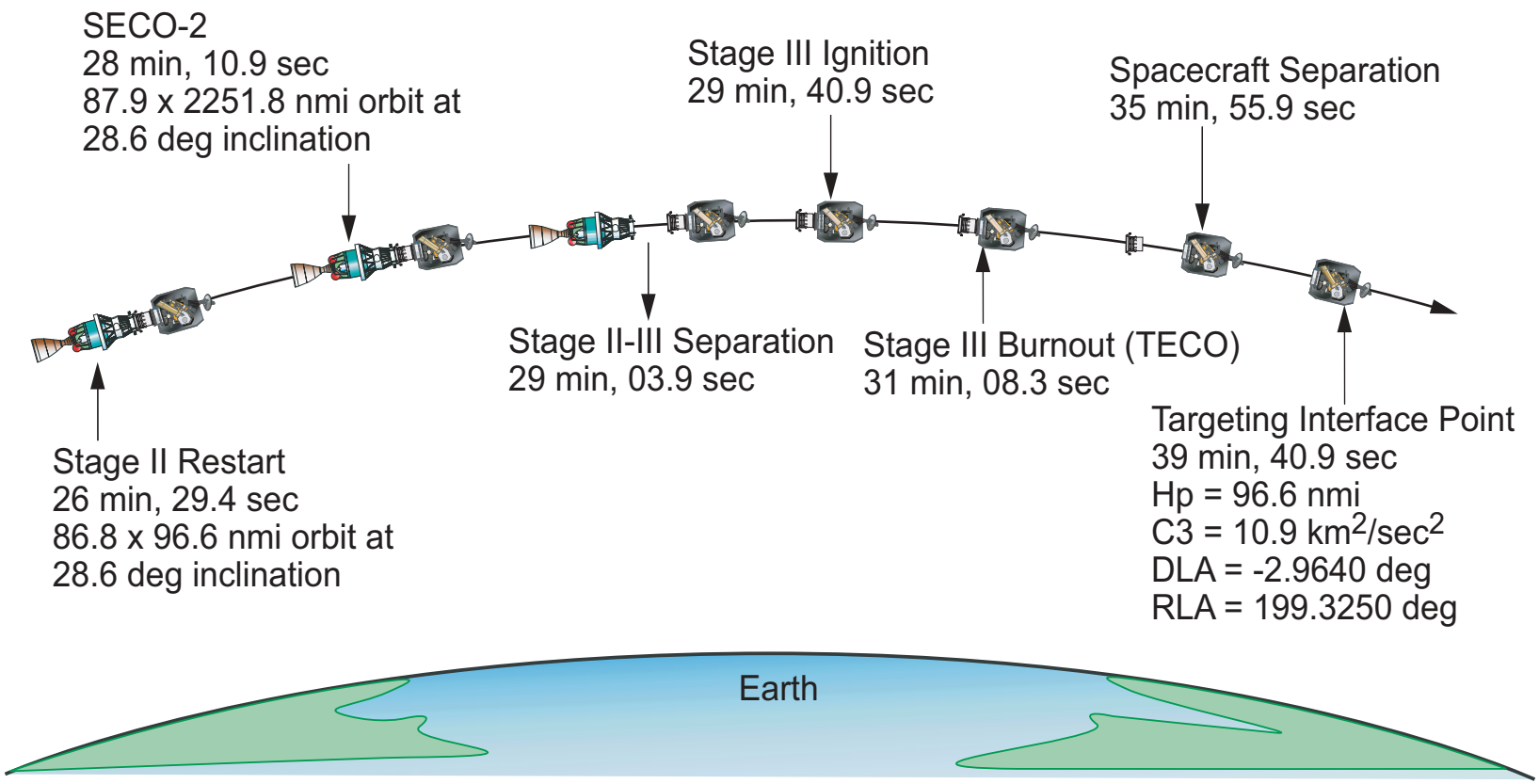
Deep Impact – Second and Third Stage Sequence of Events for 08 January 2005

Event	95-deg Time (min/sec)	101-deg Time (min/sec)
Begin thermal roll maneuver	13:05.0	13:05.0
End thermal roll maneuver	22:45.0	20:40.0
Begin maneuver to restart attitude	22:55.0	20:50.0
End maneuver to restart attitude	24:25.0	22:20.0
Stage II restart ignition	26:29.0	24:22.3
Second cutoff - Stage II (SECO II)	28:10.9	26:04.3
Fire spin rockets	29:00.9	26:54.3
Stage II-III separation	29:03.9	26:57.3
Stage III ignition	29:40.9	27:34.3
Stage III NCS enabled	29:40.9	27:34.3
Stage III burnout (TECO)	31:08.3	29:01.7
Deploy yo-yo weights - NCS disabled	35:50.9	33:44.3
Spacecraft separation	35:55.9	33:49.3
Targeting interface point	39:40.9	37:34.3

Deep Impact – Second and Third Stage Sequence of Events for 12 January 2005



Note: Values shown are for the 95-deg flight azimuth
8 January 2005 launch date.

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Deep Impact Flight Mode Description
Boost Phase

- Launch from Cape Canaveral Air Force Station Complex 17B
- 95 deg and 101 deg flight azimuth
- Direct flight azimuth mode employed (combined pitch/yaw rates)
  - Eliminates early large roll maneuver orient vehicle Quad II downrange
- 6 solid motors ignite at liftoff and 3 ignite in the air, after first 6 have burned out
- Vehicle rolled to orient Quad II downrange (±30 degrees) after solid motor jettison to meet spacecraft instrument requirement
- Boost trajectory designed to meet controllability, structural, and environmental constraints while maximizing performance
- First-stage burns to depletion
- Stage I-II separation 8 seconds after main engine cutoff (MECO)
- Payload fairing jettison meets free molecular heating rate of <0.1 BTU/ft2-sec
- At SECO-1, vehicle in 90 nmi (167 km) circular parking orbit
- Orbit inclined 28.6 deg for 95 deg azimuth and 29.7 deg for 101 deg azimuth

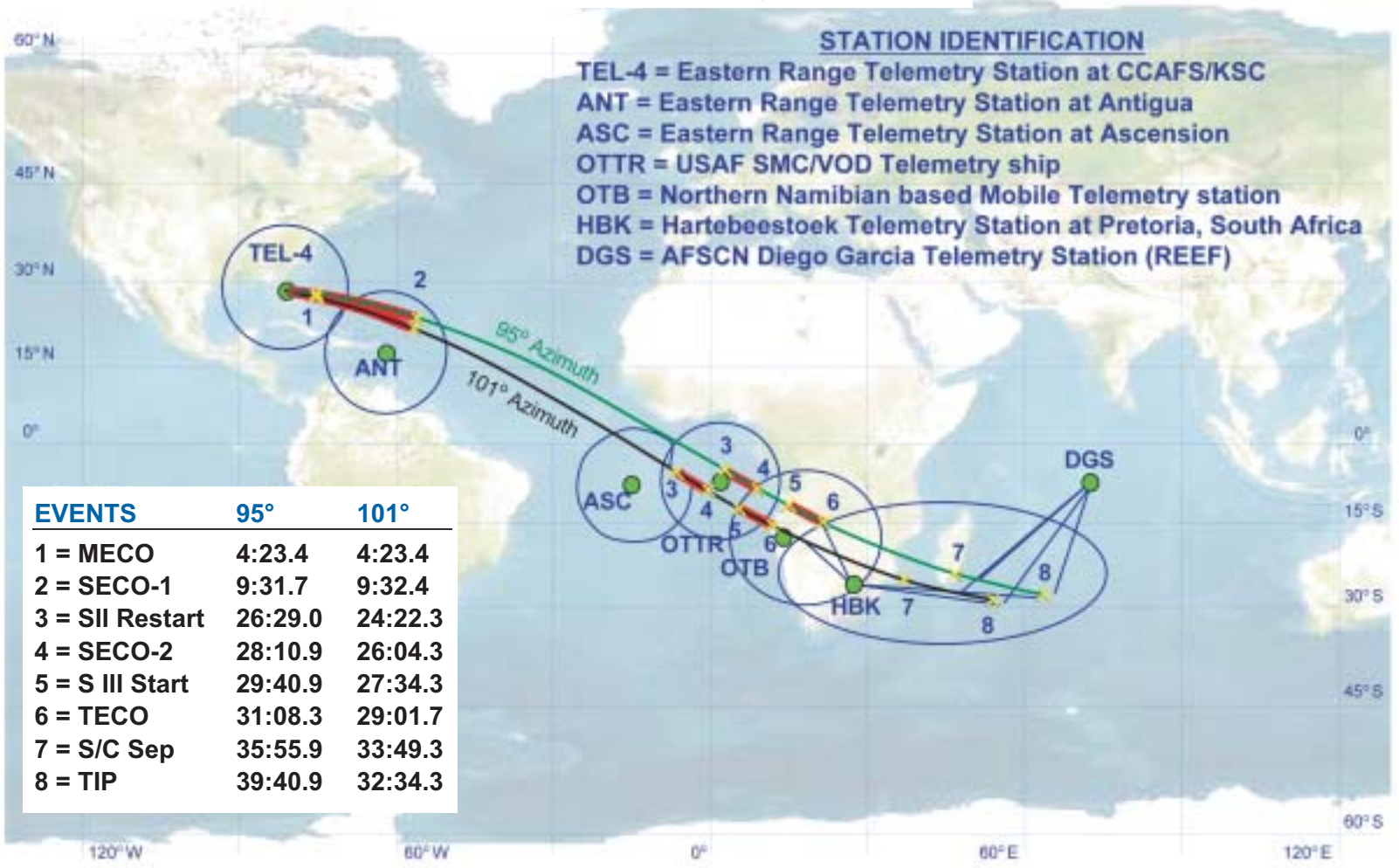
Deep Impact Flight Mode Description
Second & Third Stage

- Following SECO-1, vehicle is re-oriented to thermal roll attitude
  - Vehicle maneuvered to meet spacecraft instrument Sun angle requirement
  - Coast roll rate of 6.1 deg/sec with roll reversal
- Vehicle then reoriented to second stage restart attitude
- Restart burn over west coast of Africa
  - Mobile telemetry coverage off west coast of Africa and from Namibia
- Third stage spun-up 50 seconds after SECO-2 and separated 3 seconds later
- 40 seconds after spin-up, third stage motor burn (~87.3 seconds) injects spacecraft into desired orbit
  - Telemetry coverage from Hartebeesthoek and Diego Garcia
- Yo-Yo despin weights deployed 5 seconds prior to spacecraft separation
- Spacecraft separated 375 seconds after third stage ignition
  - Telemetry coverage from Diego Garcia

Deep Impact Orbit Trace

(08 January 2005)

Telemetry Station Elevation = 2 degrees
DTO data for January 12, 2005.



EVENTS	95°	101°
1 = MECO	4:23.4	4:23.4
2 = SECO-1	9:31.7	9:32.4
3 = SII Restart	26:29.0	24:22.3
4 = SECO-2	28:10.9	26:04.3
5 = S III Start	29:40.9	27:34.3
6 = TECO	31:08.3	29:01.7
7 = S/C Sep	35:55.9	33:49.3
8 = TIP	39:40.9	32:34.3

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DEEP IMPACT
First Look Inside A Comet
July
2005
DELTA II

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Fact Sheet

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Boeing Delta II
Deep Impact Mission

Mission: Deep Impact

Deep Impact will be launched to a planned collision path with the comet Tempel 1. Deep Impact consists of two spacecraft, a mother ship and an impactor that will collide with the comet. Upon impact, the impactor will leave a crater, enabling scientists to learn more about comets and their role in the formation of the Universe.

The impactor will collide with the comet in July 2005. It has an autonomous guidance system, propulsion system and onboard cameras to keep it on course after its release from the mother ship, which will fly by the comet to take images of it following impact. The Deep Impact impactor measures one-meter in diameter, is 0.8-meters tall and weighs approximately 370 kg. It will leave a crater between the size of a house and a football stadium, and approximately two-to 14-stories deep. Post-impact debris (dust and gases) and the crater will also be observed by the Hubble, Spitzer and Chandra telescopes as well as telescopes on Earth.

Date: January 12, 2005

Window: 1:47:08 p.m. EST (Instantaneous window)

Site: Space Launch Complex 17B
Cape Canaveral Air Force Station, Fla.

Vehicle: Boeing Delta II 7925-9.5 Configuration

- Three-stage launch vehicle
- Rocketdyne RS-27A main engine
- Aerojet AJ10-118K second-stage engine
- Thiokol Star 48B third-stage motor
- Nine Alliant Techsystems solid rocket boosters
- Nine-and-a-half-foot diameter payload fairing

Customer: NASA Jet Propulsion Laboratory

Spacecraft Developer: Ball Aerospace and Technologies Corp.

# # #

Contact:
Boeing Communications: (714) 896-1301
Boeing Launch Hotline: (714) 896-4770
Boeing Delta Web site: www.boeing.com/delta