

Unofficial Space Shuttle Launch Guide

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The following is the Unofficial Space Shuttle Launch Guide. This file contains information on how to get a launch or landing pass, and if you can't get one, where to view the shuttle for launch, re-entry or landing. This file also contains the distances to the pads from the various viewing sites, Shuttle frequencies, HAM frequencies for listening to and watching NASA select, hints on photographing launches, where to watch SSME test firings, how to get accredited as a Press Personage, internet sites to get additional NASA information, how to get the latest two line element sets, and information for teachers on how to access NASA information.

New * Congressional NASA VIP Launch Passes

Please send changes, updates, or information you think should be in this to:

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Shuttle Manifest

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<http://www.sworld.com.au/steven/space/shuttle/manifest.txt> (Unofficial Manifest)

<http://www.nasa.gov/missions/highlights/schedule.html> (NASA manifest)

http://www.nasa.gov/mission_pages/station/structure/iss_manifest.html (NASA ISS manifest)

Shuttle Launch Guides

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<http://www.sworld.com.au/steven/space/shuttle/guide.txt> (Unofficial Guide)

http://www.nasa.gov/centers/kennedy/about/view/view_shuttle.html (NASA KSC guide)

<http://spaceflight.nasa.gov/shuttle/future/launch.html> (NASA guide)

<http://www.kennedyspacecenter.com/launches/index.asp> (KSC Visitor Complex)

http://www.launchphotography.com/Shuttle_Launch_Viewing.html (Total Eclipse)

<http://home.tampabay.rr.com/k4lk/shuttxt.htm> (Dana Rodakis' Launch Guide)

<http://www.sworld.com.au/steven/space/shuttle/kit/> (Unofficial Press Kits)

<http://www-pao.ksc.nasa.gov/kscpao/presskit/presskit.htm> (NASA KSC Press Kits)

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<http://www.nasa.gov/audience/formedia/presskits/index.html> (Official Press Kits)

Shuttle Launch Records

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<http://www.sworld.com.au/steven/space/shuttle/record.txt> (Unofficial Record)

http://www.nasa.gov/mission_pages/shuttle/shuttlemissions/list_main.html (NASA Record)

Other Shuttle Information

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<http://www.sworld.com.au/steven/space/shuttle/images/> (launch images)

<http://www.nasa.gov/centers/kennedy/shuttleoperations/status/2005/index.html> (launch status)

<http://www-de.ksc.nasa.gov/de/maps/kscarea.htm> (map of KSC area)

http://www.nasa.gov/mission_pages/shuttle/main/index.html (NASA Shuttle Web)

<http://www.nasa.gov/centers/kennedy/shuttleoperations/index.html> (NASA KSC Shuttle Operations)

<http://www.kennedyspacecenter.com/> (KSC Visitor Complex)

For the latest and greatest information call the following:

(321) 867 4636 – Recorded manifest of anticipated launch dates.

(321) 867 0600 – Recorded launch status during countdown.

(321) 867 2525 – Space shuttle launch preparations.

(321) 867 3900 – Space shuttle status line. Technical, lots of TLA's. Just remember, we warned you.

(321) 867 2468 – Cape Press Site) thanks to Max White

(321) 494 5933 – USAF Public Affairs Office) <max@xxxxxxxxxxxxxxxx>

1 800 572 4636 – Visitor Information Center information and next launch.

1 800 KSC INFO – Florida 1 800 number. Florida only information thanks to Richard F. Jones <rfj@xxxxxxxxxxxxxxxx>

ELV Manifests

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For Expendable Launch Vehicle Manifests check out

<http://www.sworld.com.au/steven/space/uscom-man.txt> (Unofficial US Commercial)

<http://www.sworld.com.au/steven/space/usmil-man.txt> (Unofficial US Military)

<http://www-pao.ksc.nasa.gov/kscpao/schedule/mixfleet.htm> (KSC mixed fleet)

<http://newproducts.jpl.nasa.gov/calendar/> (JPL Space Calendar)

<http://www.flatoday.com/space/next/97sked.htm> (Florida Today)

<http://mocc.vandenberg.af.mil/launchsched.asp> (Vandenberg 30th Space Wing)

<http://www.patrick.af.mil/45Rans/schedule/page2a.htm> (FL 45th Space Wing)

http://ourworld.compuserve.com/homepages/rawhide_home_page/vandenbe.htm (VAFB)

http://ast.faa.gov/linfo_vsite/launch_info.cfm (US Dept. of Transport)

http://yyy.tksc.nasda.go.jp/Home/Press/launch_future_e.html (NASDA, Japan)

<http://www.arianespace.com/us/status/povi.htm> (Ariane)

Causeway Site Passes

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Thanks to werners@xxxxxxxxxxxxx, Mark and Julie Bixby <markb@xxxxxxxxxxxxxxxxxxxx>, Christopher A. Poterala <potsie@xxxxxxxxxxxxxxxxxxxx>, Michael Borthwick <holden@xxxxxxxxxxxxxxxxxxxx>, Ned Forrester <nforrester@xxxxxxx>, Robert Henry <lafrrh@xxxxxxxxxxxxxxxx> and others.

You can view shuttle launches right from the base at the NASA Causeway Site which is about 10 km from the launch pad.

Causeway passes from NASA are no longer available to the general public. However, if you know someone at NASA, you can be nominated by them. You will need to give the names of all the people attending the launch with you, your affiliation, and your mail address to your nominator. Non-US citizens also need to give your citizenship, date and place of birth, and your passport number to your nominator. If approved, the pass is then mailed to you.

Only those selected will be notified by mail. The passes will then be mailed to the recipient's address approximately three weeks prior to the launch. Only one request per person will be honored. Only one pass will be issued per request. If you will be leaving your residence before the pass will reach you, give the address in Florida where you will be staying, as well as your home address.

It is recommended that you be at one of the KSC entry gates at least two hours before launch as traffic can become quite heavy. The launch pass is good for that launch no matter how many times it is postponed.

The KSC Visitor Complex (run by Delaware North Park Services) offers bus rides from the Visitor Complex to the Causeway Site. The cost is \$50 for a launch transportation ticket (LTT). A viewing package ticket is \$51.50 for an adult and \$41.50 for children aged 3 to 11. An LTT includes both the maximum access ticket to the Visitors Center and transport to the west abutment of the causeway to see the launch pad and launch proper.

LTT and LKT tickets are usually available for the next shuttle mission from the KSC Visitor Complex (open seven days a week from 9am to 5pm, except launch days). Call the Visitor Complex at (321) 449 4444 or email kscinfo@xxxxxxxxxxxx if you have any questions. The buses leave from the Visitor Complex and bring you back there after the launch. You get to hang out at the Visitor Complex before and after, so you can skip a lot of the traffic. Tickets have to be bought up ahead of time at the Visitor Complex or you can order them online at

<http://kennedyspacecenter.stores.yahoo.net/stpspat.html>

A view of where you will be taken can be seen at

<http://images.ksc.nasa.gov/photos/1988/medium/KSC-88PC-1193.jpg>

If the tickets are sold out, an alternate source is Central Florida Tours <http://www.centralfloridatours.com/> They recently sold tickets for STS-114 for \$109 and seemed to have tickets for sale right up to the launch date. This company picks you up and drops you off at your hotel in Orlando/Kissimmee (Disney World) area, and provides you with the same tickets you get from the

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KSC Visitors Center. The commercial tour company has a more restrictive cancellation and "relaunch" policy than getting tickets direct from KSC Visitors Center, and you don't get a parking placard.

Another source of tickets is eBay <http://www.ebay.com> However, prices for these tickets can be very expensive, reaching about \$250 for STS-114.

Other Viewing Recommendations (frederick.mckenzie-1@xxxxxxxxxxxxxxxx and
===== others)

If you can't get a launch pass I suggest you come to Titusville. Go east on State Road 50 from I-95, to US-1. Go north on US-1 to the "Miracle City Mall" at Harrison. Park somewhere north of this spot. Anywhere north along highway 1, or east (as far as you can) along highway 406 (402) is good (specifically Sand Point Park), just as long as you can see the VAB and don't have trees blocking the view. If you can afford it, just pay the \$10 to park in someone's yard along the river. Also you can try Jetty Park at Port Canaveral (you will be south of the launch looking north). Space View Park claims to be the best place to view Shuttle launches from Titusville
<http://www.nbbd.com/godo/spaceviewpark/index.html>

If LTT's are sold out, you can buy a Launch Viewing from KSC Visitor Complex ticket. The KSC visitor complex is only 1 to 2 km further away from the pads than the causeway, but the view to the pads are obstructed by trees and powerlines. Tickets cost \$38 for an adult and \$28 for a child 11 years or younger.

Regardless of where you are going to see it, arrive early (at least 2 hours before launch). Be prepared to get into some real heavy traffic, it will also take some time to get out of the area. Bring along some food and drink, umbrellas, sun glasses, sun screen, portable TV/radio, binoculars, VCR, whatever.

When watching a launch, listen to FM Station 91.5 (it is a local religious station) or AM 580 out of Orlando (Thanks to Matthew DeLuca). NASA Select Television is carried on Spacenet 2, transponder 5, channel 9, 69 degrees West, transponder frequency is 3880 MHz, audio subcarrier is 6.8 MHz, polarization is horizontal.

TV: Local stations such as channels 56, 2, 6 & 9 sometimes have live coverage. They usually just interrupt the program that is in progress for the final 2 minutes of prelaunch, and then a couple of minutes after launch. Same for landing.

Radio: Some local radio stations to listen to are 91.5 FM, 99.3 FM, 101.1 FM, 1350 AM and 580 AM.

Robert Henry <lafrh@xxxxxxxxxxxxxxxx> reports the following.

Access onto the KSC Visitors Center is through metal detectors. You can not bring on backpacks, "large items", sharp items, etc. I used a canvas shoulder

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bag, but was warned that that might be too big; I had no problems with it. Everything you bring on site will be searched. They will want to see that all electronics (cameras, cell phones, radios) appears to work, cameras can be viewed through, and so forth. Some people brought tripod style folding chairs. Some others brought lightweight sunshades that erect like a tent; this was a very good idea.

For summer launches it is CRITICAL that you manage your exposure to the sun, heat and humidity, or else you will get sunburn, heat stroke and be in (very) bad shape by the time of the launch. Bring and wear a big hat and sunglasses, and wear sunscreen on all exposed skin. Wear light colored, light weight long sleeved shirt and pants. The Visitor's Center was selling 12oz (400ml) bottles of water for \$2.50 (or more), and there were no drinking fountains in sight. Despite the potential ban, I brought in a canteen, which the guards didn't seem to mind, and forced myself to drink at least 500ml of water an hour, which I got from the faucet in the bathroom. I was still dehydrated at the end of the day.

Hints for First-Time Launch Attendees

This section offers hints and advice for those attending a shuttle launch for the first time. Included are tips on

- what launches to attend,
- obtaining launch passes,
- when to arrive for a launch, and
- where to stay.

For the first time shuttle launch viewer, I'd say that you should choose your launch wisely. For instance, if you are travelling half way around the country (or world), don't plan too heavily on seeing a launch that has just a 6 minute launch window. Instead, pick one that has a long 2.5 hour window if possible. That increases the odds that you'll actually see it go up.

Secondly, if you are viewing the launch from the NASA Causeway, wait for a launch from Pad A. It is significantly closer than Pad B is. Thirdly, your odds at seeing a launch may be better for early morning (e.g., near sunrise) launches than for launches at other times of the day or night. There are several reasons for this: at sunrise at KSC, the TAL sites are still in daylight; the winds are usually lighter in the morning; and the sea breeze, which can bring clouds and rain showers over the space center, has not yet had time to begin.

Regardless of where you are viewing the launch from, secure your launch pass as early as possible. Most, if not all, of the various types of passes are definitely a finite resource, and are given out on (more or less) a first come, first served basis. You should begin acquiring your launch pass or passes two to three months before the launch date. Elsewhere in this guide you will find information on the different types of launch viewing passes. Many people choose to view a launch from the shore in Titusville, but there is really no reason not to get a closer view.

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When going to view the launch, arrive on-site as early as possible. The center opens for viewing site traffic about 4 hours prior to a launch, and with good reason. The traffic can be quite heavy in the hours leading up to a launch, and the last thing you want to do is to get to the viewing site late (or not at all). Additionally, the KSC gates will close about one hour prior to launch to clear the roads for emergency traffic, so if you're late, you may be out of luck. Also, do not arrive at a KSC gate before they are open for viewing site traffic. Although other traffic is allowed through, you will be turned away by the KSC police even if you're a minute early.

Another bit of advice for a first time launch viewer is to not focus too heavily on taking lots of photographs. The event happens so quickly that before you know it it's over and you may realize that you viewed the whole thing with one eye closed and the other stuck in your viewfinder. I've attended some launches where my primary goal was to take pictures or video, and others where I just stood there and watched it go up without worrying about pictures. I have to say that I enjoyed the latter much more, but the tradeoff is that I had fewer pictures to take home.

There are many hotels to choose from in the Kennedy Space Center area:

Cocoa Beach

Best Western Cocoa Inn 321 632 1065
Cape Colony Resort 321 783 2252
Cocoa Beach Oceanside Inn 321 784 3126
Crossways Condominium 321 784 5331
Crossways Inn Resort 321 783 2221
Days Inn Oceanfront 321 783 7621
Discovery Beach 321 784 2550
Hilton 321 799 0003 & 1 800 526 2609
Holiday Inn 321 783 2271 & 1 800 HOLIDAY
Howard Johnsons 321 783 9481 & 1 800 654 2000
Motel 6 321 783 3103
Ocean Landing 321 783 9430
Ocean Suite Hotel 321 784 4343
Wakulla Motel 321 783 2230

Merritt Island

Holiday Inn Merritt Island 321 452 7711

Cape Canaveral

Radisson Resort at the Port 321 784 0000
Canaveral Towers 321 784 1130
Royal Mansions Resort 321 784 8484

Titusville

Best Western Space Shuttle 321 269 9100

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Days Inn 321 269 9310
Holiday Inn (riverfront) 321 269 2121
Howard Johnson (waterside) 321 267 7900
Quality Inn 321 269 4480
Ramada Inn 321 269 5510

Reserve your room well in advance—at least 5 or 6 weeks prior to the launch date. Hotel rooms have been known to fill up quite rapidly.

Distances to Pads

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viewing site Pad A (km) Pad B (km)

Press Site 4.9 5.5
Barge Turn Basin 4.9 5.5
VIP/Family Site 6.2 5.3
Static Test Road 8.1 10.1
NASA Causeway (west end) 9.8 11.7
NASA Causeway (mid point) 10.6 12.6
NASA Causeway (east end) 11.4 13.6
KSC Visitor Center 12.1 13.0
Astronaut Hall of Fame 17.5 17.5
closest point in Titusville 19.2 18.1

Internet Access for Visitors to KSC (Jerry Russell, jdr@xxxxxxxxxxxx)

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Any visitors to KSC that would like to have Internet access to get their mail, stay in touch, are welcome to stop by our Network Control Center in Cocoa, Fl. and get online free! If you have a computer with you we will give you a FREE guest account for 24 hours, menu based (text) account with full Internet access. We are a commercial provider here in Cocoa, but offer this service to our visitors as a FREE service and encourage you to use it!
FLORIDA ONLINE, 3815 N US 1, #59, Cocoa FL 32926, (321) 635 8888 voice, 635 8833 DOS BBS, 633 4710 FLORIDA ONLINE, 635 9050 fax.

Shuttle Frequencies

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The Space Shuttle transmits on three frequency bands: UHF, S-Band, and Ku-Band. The UHF frequencies are simple AM voice and are very easy to copy. These frequencies are used for launch and landing operations, EVA operations, and as an additional voice downlink when other channels are in use for the current ground station has no S-Band capability.

The frequencies in use are:

296.800 MHz : Air-to-ground, or Orbiter to suit
259.700 MHz : Air-to-ground, or suit to Orbiter
279.000 MHz : Suit-to-Orbiter, or suit-to-suit

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243.000 MHz : Standard military aircraft emergency frequency

The S-Band system is one of the primary Orbiter downlink bands. The voice channels are digital slope delta modulated and are multiplexed in with the rest of the Orbiter telemetry and is very difficult to copy. Much of the downlink TV is on S-Band also, but is wideband FM and should be easy to copy. The frequencies are:

2287.500 MHz – Primary digital downlink

2250.000 MHz – Wideband FM with either main engine analog telemetry during launch, or TV during orbit operations.

The Ku-Band system is used in conjunction with the tracking and data relay satellites and is used much more heavily in Spacelab flights than in others. The data rate is very high (50 Mbit/s). These transmissions are directed to TDRS satellites in geostationary orbit on a frequency of 15.003 GHz.

(Information via WA3NAN, and WA4SIR)

Ed Sileo (edsileo@xxxxxxxx) says that Shuttle audio can be heard on 169.4 MHz at Edwards Air Force Base (EAFB). The transmitter site is on Lehman Ridge on the east side of Edwards near the Astronautics Lab. This can be heard during all flights since you never know when the shuttle may land at EAFB.

Shuttle Audio Retransmissions

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Excerpt from the Goddard Amateur Radio Club (GARC) Shuttle Retransmission Fact Sheet (from Jim Blackwell, N3KWU, HRSBLACKWELL@xxxxxxxxxxxxxxxxxxxxxx)

Retransmission of Shuttle air-to-ground audio from the GARC (WA3NAN) may be heard on the following frequencies:

Frequency Mode Antennas (MHz)

3.860 SSB LSB N-S/E-W Dipoles
7.185 SSB LSB N-S/E-W Dipoles
14.295 SSB USB 3-element Yagi
21.395 SSB USB 5-element Yagi
28.650 SSB USB 4-element Yagi
147.45 FM Simplex Phased vertical

Where SSB is Single-Side-Band and LSB, USB indicate either Lower and Upper Side Band. A short-wave receiver possessing a Beat Frequency Oscillator (BFO) is needed to receive these transmissions.

GARC maintains a Bulletin Board System (BBS) which is accessible by way of the Internet, modem and packet radio. The BBS contains areas with information on the club, mail distributed by the Amateur Satellite Corporation BB (AMSAT-BB) listserv, SAREX bulletins and Space Shuttle mission information. During Shuttle missions, users can also access Keplerian Orbital Elements

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(Keys) which are generated by the club based on information generated by NASCOM at GSFC (these orbital elements are read over-the-air by our volunteer operators). The BBS is accessible by the following means:

1. Internet: telnet to wa3nan.gsfc.nasa.gov (128.183.105.17)
2. Telephone: (301) 286-4137 (up to 14.4 kbaud supported)
3. Packet Radio: WA3NAN on 145.090 MHz in DC area.

Just follow the login instructions. Note: Full access to the BBS is limited to members of the club.

GARC also maintains a WWW Server containing a wide variety of information about the club, its activities, as well as links to other Amateur Radio resources. The URL address is:

<http://garc.gsfc.nasa.gov/www/garc-home-page.html>

Excerpt from rec.radio.amateur.misc FAQ Part 3 (modified):

Shuttle audio is re-transmitted by the following Amateur Radio stations.

Station Centre VHF 10m 15m 20m 40m 80m

K6MF ARC 145.585 7.165 3.840
W1AW ARRL 147.555 28.0675 21.0675 18.0975 14.0475 7.0475 3.5815 1.818
WA3NAN GSFC 147.450 28.650 21.395 14.295 7.185 3.860
W6VIO JPL 224.080 21.280 14.282 7.165
W5RRR JSC 146.640 28.495 21.350 14.280 7.227 3.850
AK8Y LERC 145.670 or 147.195 (alternate)
WB4FUR SSC 146.700
KA9SZX 146.880 (Video at 426.250)
K4GCC 146.940
WA4VME 145.170

You might also try 20192 LSB which is NASA.

All frequencies are in MHz. Use FM on VHF, USB on 10-20m, LSB on 40-80m.

W1AW – ARRL, Newington, CT (news bulletins, 9:45 PM and 12:45 AM EST)
K6MF – NASA Ames Research Center (ARC), Moffett Field, CA
WA3NAN – NASA Goddard Space Flight Center (GSFC), Greenbelt, MD
W6VIO – NASA Jet Propulsion Laboratory (JPL), Pasadena, CA
W5RRR – NASA Johnson Space Center (JSC), Houston, TX
AK8Y – NASA Lewis Research Center (LERC), Cleveland, OH
WB4FUR – NASA Stennis Space Center (SSC), Hancock County, MS
KA9SZX – Champaign-Urbana, IL
K4GCC – John Anderson, Titusville, FL (near or at Kennedy Space Center)
WA4VME – Melbourne, FL (near or at Kennedy Space Center)

You can also go to

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<http://spacelink.nasa.gov/Educational.Services/Technology/Shuttle.Amateur.Radio.EXperiment/Hearing.Space.Shuttle.Communications>

for a listing of repeaters in the USA that offer this service.

Retransmissions of Shuttle audio on amateur radio frequencies

<http://www.amsat.org/amsat/sarex/shutfreq.html>

State City Date Reported Frequencies (MHz)

AL Birmingham 10/10/89 145.150 145.380
AL Huntsville 12/31/92 147.100 173.025
AR Russellville 3/24/92 439.250
AZ Phoenix 12/9/91 421.250 449.000
CA Los Angeles 1/7/90 52.640 224.940
CA Los Angeles 12/21/89 1241.250
CA Los Angeles 12/4/91 145.320 145.460 445.400
CA Los Angeles 12/4/91 445.425 446.575 447.000
CA Los Angeles 12/4/91 447.025 447.400 447.475
CA Los Angeles 12/4/91 448.375 448.500
CA Monterey Bay 7/1/91 145.585 443.300
CA Mount Wilson 10/18/95 224.940
CA Northern 3/19/90 145.530
CA Redondo Beach 9/23/93 145.32 W6TRW
CA Sacramento 4/10/91 147.195
CA San Diego 3/23/92 449.450 1277.25
CA San Francisco 4/29/91 427.250 444.775
CA San Joaquin Vly 5/6/89 52.22
CA Santa Barbara 4/21/90 1277.000
CO Boulder 1/5/96 145.460 (NASA select audio)
CO Colorado Springs 1/5/96 145.160 (NASA select audio)
CO Denver 1/5/96 147.225 224.980 (NASA select audio)
DC Washington 11/28/83 147.450 (Greenbelt, MD)
FL Cape Canaveral 10/11/89 146.940
FL Clearwater 2/15/97 145.23
FL Clearwater Beach 4/10/95 442.075
FL Daytona Beach 1/25/92 147.150
FL Fort Lauderdale 12/03/93 442.650
FL Jacksonville 4/25/90 147.12
FL Lakeland 7/18/92 147.375
FL Largo 4/24/95 51.84
FL Largo 4/10/95 421.25 (video & audio)
FL Orlando 5/8/92 147.150
FL Port Richey 1/2/96 443.950
FL Sarasota 2/15/97 442.55
FL St. Petersburg 1/2/96 147.285 443.625
FL Vero Beach 4/19/90 145.130
FL North Lauderdale 12/03/93 145.750
GA Ashburn 5/5/89 147.285
GA Atlanta 12/4/91 146.655 147.345 427.250

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GA Forsyth 6/7/90 147.915
IA Cedar Rapids 10/18/89 146.400 444.300
IL Champaign-Urbana 11/30/93 146.880
IL Chicago 4/19/90 145.350
IL Downers Grove 9/23/93 145.350
IL Morton Grove 12/7/93 145.350
IL Rolling Meadows 2/12/92 145.350
IN Indianapolis 3/15/92 426.250
ME Portland 12/16/89 146.925
ME York 12/16/89 224.840
MN Central 2/19/90 149.200
MN Twin Cities 3/11/89 145.150 147.120
MN Waseca 1/2/90 147.450 427.250
MO Gladstone 12/7/93 224.660
MO Kansas City 3/25/92 145.430 426.250
MO St. Louis 1/25/92 442.000
NJ Central 7/5/92 443.400 (PL 141.3)
NJ Northern 12/12/93 146.610
NY Albany 9/6/91 146.820
NY Long Island 3/30/92 448.425
OH Dayton 5/4/89 145.110
OH Greenville 3/11/90 146.790
OK Tulsa 2/6/92 144.340 146.940 421.250
PA Pittsburgh 6/25/92 145.470
PA Pittsburgh 9/23/93 145.650
SC Orangeburg 12/3/93 146.805
SD Watertown 1/14/92 145.550
TX Dallas 7/18/90 145.310 448.750
TX Dallas 9/13/91 146.600
TX Houston 6/27/92 146.640
WI Wausau 9/5/91 146.820 147.060 421.250
VA Norfolk Feb 1993 144.340 431.750 FM audio, 427.250 video

Thanks to Dana Rodakis (dgra@xxxxxxxxxxxxxxxxxxxx) and Gary Grahn (WA1TSS, GGrhn@xxxxxxx)

Amateur TV Repeater of NASA Select

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Chris Best (clbest@xxxxxxxxxxxxxxxx) writes:

I belong to a local ham radio club called the Launch Information Service and Amateur Television System (LISATS for short). We operate, in the Cocoa Florida area, an Amateur TV Repeater where we, during shuttle missions, re-broadcast NASA Select (from a satellite receiver located at the repeater site). We also have a computerized bulletin board (VIDEO) at the repeater site which cycles through screens of interest to hams, one being a projected launch schedule (shuttle and expendable). The LISATS repeater can be viewed by anyone with an outside antenna and a cable ready TV in the launch area. Please checkout:

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<http://ddi.digital.net/HamRadio/lisats.html>

The two primary points of contact for LISATS are myself (ham radio callsign N4KCI) or Ernie Baldini (ebaldini@xxxxxxxxxxxxxxxx, K4RBD) who is the preferred Amateur TV expert.

Photographing Shuttle Launches

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The following link gives detailed information on shuttle launch photography

<http://rescomp.stanford.edu/~stanj/Travel/STS-93/exposure.html>

andreas@xxxxxxxxxxxxxxxxxxxx has some hints for photographers:

Get the longest lens available (e.g. rent one at Helix). I used a 300mm shooting from Titusville and was still too far away to clearly see the shuttle. However I could take beautiful shots of the engine's firetrail and the smoke.

Put your camera into continuous shooting mode (unless you have a VERY high speed camera like a Nikon), as the whole spectacle will be over within no time. I shot about 1 roll of film (36 pictures) until the shuttle was gone for good while almost constantly pressing the button.

Use a LOW speed film (ASA 50) as the light is so bright (Remember: NASA launches only under good weather conditions), that even with a long tele lens you still have enough light left for short exposure times (I had 1/1000 with F 5.6 and a Kodachrome 64). That way making detail enlargements is also easier, meaning less grainy.

Try to AVOID a tripod, as the shuttle moves "upwards to the right" (at least from Titusville with the standard 28 degree inclination). You are more flexible if you use a monopod or even better one of those professional harnesses, that you wear like a jacket and that support your long lens (like a tripod attached to your upper body).

During the night before the launch you can see (at least sometimes) a search light illuminating the launch pad. With a tripod and a very long exposure time (> 20 sec's on Kodachrome 64) you'll get nice pictures as well. Make several shots with different times according to general night time photography rules.

A final hint for the early-birds: I was lucky enough to see the big and red glowing sun rising exactly behind the VAB (from the US1 in Titusville). An incredible view, that didn't even require a tripod.

Jim Blackwell (hrsblackwell@xxxxxxxxxxxxxxxxxxxx) and Todd L. Sherman (afn09444@xxxxxxx) has these hints:

I can also say something about photographing night launches. Basically, for

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STS-61 and STS-67 I used 1000 ASA film and shot at 1/1000 th of a second at F/8. For STS-61 I was at the VIP site at 5.3 km and used a 70-210 mm zoom at the 210mm setting. For STS-67, I was at the NASA Causeway (about 10 km I think) using a 500 mm f/8 lens. Got great shots in both instances. I used Kodak Royal Gold (used to be Ektar) 1000 ASA film. I would also advise anyone to remove any filters they may have on their lenses as they can get nasty internal reflections and that a good, sturdy, well-built tripod is a must, especially with the 500 mm. Even footsteps from other persons nearby can be amplified by the tripod if it's not a good one. I also used a cable release and a motor winder on the camera.

Todd L. Sherman (afn09444@xxxxxxx) has these hints on doing time exposures of night launchers from afar:

I can tell you that you should give yourself say a half hour ahead of the launch to get yourself set up and ready, with camera pointing in the direction the shuttle is expected to come up above the horizon. Make sure the camera is on a good, sturdy (as sturdy as possible) tripod, and make sure you're as far away from other people as possible because even thier walking around can cause vibrations that the tripod can pick up and exaggerate.

Set the shutter speed dial on [B]ulb and connect a length of cable release to the button. When you see the first hint of glow rising, open the shutter and hold it open with a cable release until the SRBs burn out, then close the shutter. You now have a time exposure of the launch. What you should see upon developing is a long, bright trail starting at the horizon and curving upwards into the sky as the shuttle rises. You'll also get some minor trailing of the stars. Make sure your position is as dark as possible with no nearby city lights in the direction the camera will be looking or you will get some sky "fog" which may ruin the shot. If it's partly cloudy, try taking the shot anyway. You never know what might happen. There may be breaks in the clouds through which the SRB contrail may show through, providing an interesting shot, still.

Don't forget to put your photo up on the web! Then tell us where to find the photos in one or more of the space-related newsgroups, so that we can all `ooh and aww' at them! You'll also want to tell us how you made the shot... film speed, aperture setting, shutter speed, lens size, camera used, sky conditions, and direction of light.

Most-likely, from your own city's location, you won't be able to see any detail of the shuttle or it's outline (especially here in Gainesville, 145 km away from KSC). You'd need a telescope for that and, besides... you'll be too busy concentrating on your exposure to have a look.

If you have any filters on your camera, though...take them off for a nighttime shot. These things only happen once in a long while, and you're only going to get one try (unless you're gifted with a large budget and can afford an arsenal of other cameras). You don't want the chance of internal glare or reflections ruining your shot.

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And chain little Jimmy to a stake permanently out of your camera's field of view. You don't want him jumping or standing in front of the camera and ruining the shot, either.

Expendable Vehicles

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These are usually launched from the southern part of the base, best viewing is at Jetty Park or south along the beaches of Cape Canaveral and Cocoa Beach. Not as crowded as shuttle launches, but still give yourself some time to arrive early. Jetty park can fill up so plan an alternate. Again bring your stuff.

You can also watch expendable vehicle launches at the KSC Visitor Complex from the LC39 Observation Gantry on the KSC tour. Tickets go on sale approximately four days before launch.

Philip Chien (KC4YER@xxxxxxxx) wrote:

For the Delta launches at the Cape the press site is actually within the Impact Limit Lines (about 1.5 km from the pad), but the press is considered part of the launch team, so we're there under an exemption as launch critical personnel. There are discussions underway to move the press site to the Trident turn basin at the south end of the Cape, not that far from the publicly accessible areas. About the only advantage to that site is you have a straight line of sight to the Atlas, Delta, and LMLV launch pads.

The VIP viewing site for Deltas and Atlases is located in the middle of the Cape, close to the 'skid strip' about twice as far from the launch pads. It also has the disadvantage of obstructions in the way, primarily trees.

Landing Information

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Unfortunately the KSC landing strip cannot accommodate a "viewing public" because it is situated on wetlands, however gt3597a@xxxxxxxxxxxxxxxx suggests:

If you do happen to try and view the landing at KSC, do not despair when you realize actually how far away US 1 is from the runway. Even a moderately powered set of field glasses will provide good views of the Orbiter as it decelerates into the KSC area. That twin sonic boom is very unique and, for me, was well worth the drive by itself. You will actually be able to see the Orbiter as it comes into the KSC area and turns on the heading alignment circle better than during the final approach.

Don Diego (don.diego@xxxxxxxx) and others also suggest:

The best viewing site for the Shuttle landings is the Shuttle Landing Facility (SLF) Mid-Point. There are bleachers available about 140–180 metres from the runway. What a great spot. Not only is it the best possible viewing

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site, you get to hob knob with astronauts and VIP's. VIP invitations now sent out by NASA headquarters are for launches or landings (see following section on VIP passes). Other passes from NASA may also invite you to the landing if you are a shuttle worker or involved with the payload. Unless you have very good connections, the general public cannot have access to the SLF.

As with the launch facilities NASA Select audio is provided on site as are restroom facilities and vending areas run by NASA.

For a realistic spot there's really only one choice. On US1 in Titusville across the Indian River from KSC. Hope it's not early in the morning, otherwise, you're going to be facing directly into the sunrise. I've tried on several occasions to try to catch a glimpse of the orbiter coming in as I was in Cocoa Beach or the city of Cape Canaveral but you're just too far away.

Whether you get lucky enough to get on KSC or have to settle for the US1 site you're in for a real treat. A landing is every bit as exciting as a launch. During a launch it's Boom, Zoom and in two minutes it's gone. But with a landing you have time to soak it all in. The key is picking it up visually as soon as possible. The thing to remember is at 15,000 metres (50,000 feet) the orbiter can be seen directly over the landing sight. Look straight up and watch for the puffs of smoke coming from the Reaction Control System (RCS) jets. Once you pick those up you should have no difficulty following it around the HAC and all the way down. Contrary to popular belief the thing doesn't land silently. When you've got an object that big and bulky cutting through the air at that velocity you get a wind rushing noise that has to be unique.

US1 in Titusville can be accessed from SR50 from Orlando or I-95 from the North or South. Local radio stations that have the best NASA coverage for any NASA related event are WMMB AM 1240 or 99.3 FM. Prior to any operation events can be followed locally on TV channels 2, 6 or 9. Or pick up a copy of the local newspaper The Florida Today. Some hotels in the area also carry NASA Select.

Kim Keller <kekeller@xxxxxxxxxxxxxxxx> writes:

It is amazing that a vehicle as large as the orbiter would be hard to see landing, but it is! Here are some tips. The orbiter approaches KSC from either the northwest or the west, depending on the orbital inclination. As it enters the vicinity of KSC, its altitude is somewhere between 12 to 15 km. It will look like an airliner at high altitude, if you are fortunate enough to catch sight of it before it enters the heading alignment circle. Sometimes, you may catch sight of short contrails as the aft RCS thrusters are used to assist the rudder in steering the vehicle. They are the best clue to catching sight of the vehicle at high altitude, but they are unreliable; you may or may not see them. I start looking in earnest for the vehicle when I hear the PAO announcer say the vehicle is approaching Titusville. At that point it's helpful to know which direction the orbiter is approaching from. Generally, if it's returning from a high inclination orbit, it'll approach from the northwest. If it was a low inclination orbit, look to the west. As it flies

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over the runway, it's still at high altitude, and will begin a turn around the heading alignment circle. The direction of the turn depends on the runway direction the orbiter will use. The turn takes it out over the Atlantic.

KSC has one runway, referred to by two numbers: 15 and 33. These are abbreviations for compass headings of 150 and 330. 150 runs from northwest to southeast, 33 is just the opposite. The PAO announcer will have announced much earlier which runway will be used. This will determine where the best place to view the landing would be. If runway 15 will be used, your options are limited. You will need to be in Titusville to see the final approach.

There is a park on the edge of the Indian River at Route 407 which gives the best view of the area of the runway, but you won't see the runway itself. It is about 8 km from the park. When the orbiter touches down you will lose sight of it, except perhaps for a view of the tail. It depends on how high the trees have grown!

If runway 33 is in use, you have more options. The best place to view is from the parkway near the KSC Industrial Area. You can take some excellent pictures from this spot. This is just past the KSC Visitor Center. If you are in this area, the orbiter will pass from right to left. As it approaches, you will be able to hear it. The airflow over the structure and the sound of the APUs combine to make it sound like a powered jet. You will also see one of the Shuttle Training Aircraft flying loose formation off to one side. It will disappear from view to the north as it reaches the runway threshold. Other viewing spots for a 33 landing are the Beeline Expressway between Merritt Island and Cape Canaveral, or along the Indian River at Titusville.

Shuttle Re-entry Flyovers

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For an example of a shuttle entry plasma trail photo go to

<http://www.sworld.com.au/steven/space/shuttle/images/>

Todd L. Sherman (afn09444@xxxxxxx) has these suggestions about viewing and photographing shuttle re-entry flyovers:

You'll first need to go to the "Sightings" section of the NASA Shuttle Web site ("<http://shuttle.nasa.gov/>") a day or two before actual landing and look at the sightings list. The top part will be for viewing the shuttle over your own city while on orbit. Keep scrolling on down and you'll come to the REENTRY sightings list. This list will list many cities along the incoming flight path and offers appearance and disappearance azimuths, maximum heights, approximate times post-max-alt that the sonic boom should be heard, etc. (I'm trying to convince them to post, from now on, data for the ALTERNATE landing opportunities as well. Up till now, they've been posting only for op #1, which is nearly always waved off and, never updated once that happens.)

I've tried to catch the shuttle as it flies over Gainesville but have always been clouded out whenever it happens and I've got a camera in hand. Thus, I

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can't offer any working experience there, either...shutter speeds, apertures, film brands and speeds. Sorry. This part is a mystery I never see covered, and it would be nice if someone who HAS tried it before would offer his or her own experiences for others like me.

Edwards Landing Passes

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For a landing pass at Edwards, Mary Shafer (shafer@xxxxxxxxxxxxxxxxxxxxxx) says: (Steve Handler (cityfarm@xxxxxxx) advises us: The Public Affairs Office at Dryden Flight Research Center says that there are no landings scheduled in 1995 for Edwards and thus they are not giving out any landing passes at this time. They also indicated that the ability to see landings at Edwards is via the courtesy of the Air Force.)

There are three ways to see the Shuttle landing at Edwards AFB, listed in order of restrictiveness of access and availability.

1. The East Shore area on the lakebed. Take Hwy. 14 to Avenue F and follow the signs or take Hwy. 58 to 20 Mule Team Road and follow those signs. This area is opened about 2 days before the scheduled touchdown. The viewing area is an unimproved area so don't expect many amenities. I think that there are sanitary facilities and that food and drinks can be purchased. It's suggested that you bring food and water. Nothing is required for access to this area. If any viewing is allowed this site will be open. The only times they don't open it is for the DoD's classified missions.

Burns Fisher (fisher@xxxxxxxxxxxxxxxxxxxxxx) says the view you get depends on exactly what course the shuttle comes in on. If the shuttle lands on the ascending node of its orbit you only see the shuttle coming straight in and landing in front of you...but not too close. For a descending node landing the view is much more spectacular as you see the shuttle turning and passing right above you (described by Burns as "a *gorgeous* sight!").

2. The hillside viewing area. This is on the hillside, just above Ames–Dryden, and requires a special pass. This pass is good for one vehicle, with any number of passengers. You can't enter the Ames–Dryden complex but you can walk down the hill to the cafeteria and the gift shop, etc. More amenities, including radio transmissions from the Shuttle and JSC. Some of us believe that this area has the BEST view of the landing. I believe that the Hillside, like the East Shore, is open for all unclassified missions. These passes can be obtained by writing, as detailed below. Ames–Dryden employees can also obtain them.

3. Official guest. Access to the Ames–Dryden complex. You get to watch the landing from the ramp, which is right on the lakebed. (The Shuttle lands some distance away, depending on which runway it uses.) The crew speaks to the crowd just before they return to JSC. There are special aircraft displays (including the SR–71, F–15, F–18, X–29, etc.) in the hangars. The radio transmissions are broadcast. This method is only predicted for a few missions this year. Opening the Facility is fairly labor–intensive and very

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disruptive, so we won't do it for every possible mission.

You can write, as detailed below, to obtain these badges and parking permits. To obtain a hillside pass or official guest badges, write to:

NASA Ames–Dryden Flight Research Facility
Public Affairs Office
P.O. Box 273
Edwards CA 92523–5000

Do this early, because there is a limited amount of space. If you get these and then discover that you can't attend, please try to pass them on to someone else who can use them. Incidentally, there is no charge for any of these.

Come see the Shuttle land—it's great. Wear warm clothes!

If the Shuttle lands in the morning, it will be cool to downright cold. Forget the myth that the desert is always hot, it may be in the low 60s even in the summer at sunrise. It's frequently freezing in the winter. If it's much warmer, it's because the wind is blowing.

However, if you're an Official Guest and will be hanging around until the Astronaut Departure Ceremony, it may be warm by then. Wear layers.

Especially, wear warm footwear. Official Guests will be standing around on the cold, cold ramp and all your body heat will seep out of your feet into the concrete heat sink. Running shoes work well. Hillside Guests will be sitting up on metal bleachers. The portions of their anatomy in contact with the bleachers (feet and seat) may get real cold.

Here is a list of Freqs for the White Sands Missile Range

Military Police: 36.100 141.250
Laser Operations: 173.5625
Drone Operations: 164.500 172.400
Cooling: 168.000
Maint: 34.490
Missile Tracking: 412.875
Range Control: Channel 1 36.510
Channel 2 34.850
Telemetry: 38.450, 38.710, 38.950, 40.100, 41.450
Photography: 30.090, 41.430, 139.440
NASA operations: 34.310, 164.100, 169.075, 169.400

SSME Test Firings (thanks to David.M.Seidel@xxxxxxxxxxxxxx)

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The Stennis Space Center in Mississippi does Space Shuttle Main Engine (SSME) test firings, which, if I understand correctly, can be viewed by the public. Try their public affairs office for details. The Marshall Space Flight Center

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in Huntsville, Alabama also has an SSME test facility where you may be able to view the firings.

Press Site Passes

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If you are a legitimate, working member of the media, or have close connections with someone in the media or NASA, you can be an official Press/Media representative. This allows you much closer viewing, and material from NASA on the mission. If you cannot be verified as a legitimate media person, your request for accreditation will not be honoured. The Press Site is just east of the "Dome" at LC-39 near the VAB. The shuttle while on the pad is obscured from view by the launch towers.

Requests for accreditation should be mailed/faxed to the accreditation secretary two to three weeks prior to launch. The request must be from a credible media source and it must be on company letterhead stating the requester(s) full names, social security number, affiliation and purpose (i.e. John B. Quick, 111-22-3333, Time Magazine, photographer). The letter must be signed by the requester's supervisor/editor/or person in charge. All calls concerning accreditation should be given to Leslie. These requests can be faxed to (321) 867 2692. After you are accredited, you can call the Media tour info number, (321) 867 7819 for Photo ops, remote camera setups, etc.

Public Affairs Office
Attention: Accreditation
M/S PA-MSB
Kennedy Space Center FL 32899

Call (321) 867 2468 a couple of weeks after submitting the letter to make sure that your name is on the list as an accredited press type person.

News media may also submit requests via the new online accreditation web site at: <https://media.ksc.nasa.gov>

VIP Passes (Julie Clements and others)

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Astronauts families and other VIP's are situated at the VIP site 1.5 km north-east of the VAB and away from the press. The site is only 5.3 km from Launch Pad B, and 6.2 km from Launch Pad A. It offers great viewing of a launch and is near the site for the new Apollo exhibit site which encloses a Saturn V. You can see the backside of Pad B and therefore don't see the initial ignition very well. Any overflow from the VIP stands are sent to the Static Test Road site (which is considered to be a VIP site).

The day before launch, all VIP guests, including crew guests, must check in at the KSC Visitor Center prior to launch day and pick up their launch credentials. The personalised bus tours are no longer offered.

The day of the launch, you're transported to the VIP launch stands via bus

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from the parking lot of the KSC Visitor Center. Adjacent to the Saturn V Center are the crew guest bleachers for astronaut families and friends. These bleachers are accessible by going through the Saturn V Center or outdoor entrances to the north and south. To the south of the Saturn V Center are a separate set of bleachers for guests of NASA administration. Each person is given a coloured button which indicates which stands they are allowed in.

Children are now allowed at the VIP site, so photographers will have to deal with tripods being tripped over and sound recordists plead with parents to have their kids stop kicking the chain link fence. :-)

The crew guest area is heavily controlled by the site managers to ensure that only the people who belong there can gain access to it. Even the busses that take the crew guests (aka Extended Family) park away from the VIP busses, the crew guest busses entering the site from the north and parking at the north end of the Saturn V center. The immediate family of the crew are given the option to view the launch from a more secure area, the LCC roof.

About ten minutes after the launch the buses return and take the VIPs back to the KSC Visitor Center. From there, VIPs must contend with the traffic themselves, which is filled with all the people coming from the Causeway and Static Test Road sites.

VIP passes are very difficult to get, but may be obtained if you personally know someone who can officially nominate you. Nominators include your Congress representative (see section below), NASA officials, and astronauts and experimenters for a given mission. If you are not a family member or friend of a nominator you should expect your nomination not to be honoured by NASA. International visitors wanting a VIP pass need first contact their embassy in the US.

You will need to give the names of all the people attending the launch with you, your affiliation, and your mail address to your nominator. Non-US citizens also need to give your citizenship, date and place of birth, and your passport number to your nominator. If approved, the pass is then mailed to you.

Request your pass or passes at least 3 months in advance. Asking for a VIP pass even a month in advance is just about hopeless. NASA puts together the VIP guest list for a launch way in advance. Actually, you are not requesting a VIP pass, you're requesting a VIP invitation. All VIPs are invited guests of NASA. So, the process is that you ask to be invited, then they invite you, you accept via RSVP card, then they send you the necessary instructions. If you are invited by NASA HQ, a vehicle pass for the KSC Visitor Center is included in the invitation itself.

When you contact your nominator, be very specific. State the STS number and the target launch or landing date for the launch or landing you want to see. Whether or not your request is approved by NASA HQ is, in part, a function of how many VIP invitations have already been issued. If the Banana Creek site is full, you may be sent to the Static Test Road site instead.

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VIP passes are on a per-person basis, meaning that you'll need a pass for each person in your group.

To get an idea of what it is like to be a VIP at a night shuttle launch see

<http://rescomp.stanford.edu/~stanj/Travel/STS-93/index.html>

Congressional NASA VIP Launch Passes (Chris Morris)

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My attempt to get a NASA VIP Launch ticket was very straightforward. I emailed and called one of my state senators. (I had also called one of my state representatives and received a form letter stating that they were unable to process my request. I found out later that all members of Congress have the ability to send people to a launch viewing – you just have to find one that will actually go through the trouble of doing the paperwork – not all are willing apparently). Within 72 hours, I received a call back from one of my senator's staff. He took down the names and birth dates of each member of my family (I was quite surprised that he didn't need our Social Security numbers) along with my address and phone number. He told me that he was forwarding the information to the NASA Congressional Affairs Office, and that all VIP seating was on a first come, first serve basis. About 2 weeks later (which was also about 2 weeks before launch), he emailed me and said that I would be receiving my tickets within the week, and I did indeed receive the package. Here is part of the kicker: there are actually NO tickets, at least not in the traditional sense. Enclosed in a small 4"x6" envelope is a card (much like a birthday card) with a picture of a space shuttle launching, inside it reads that I am cordially invited to attend a launch of a space shuttle (generic invitation), along with several folded 8.5"x11" pieces of paper, including the phone number for the NASA Congressional Affairs Hotline (866-838-7437) and instructions on where to meet the busses to be taken into KSC (we actually met in the parking lot of the mall in Merritt Island, FL).

As instructed, we drove to the mall and found our busses waiting in the parking lot. There were several NASA representatives there to meet us and place us on chartered busses. The NASA representatives checked everyone's driver's license's (all attendees 16 and older needed to provide a state-issued photo ID) against their list of attendees. There were about 300 people that received Congressional VIP Passes. Everyone boarded busses and were transported to the KSC Visitor's Center for security screening. After that we got back on the busses to be taken out to our viewing area. Here is the bad news: we were taken to one of the viewing areas on the NASA Causeway (yes, the same place where everyone who buys a LTT gets to view from). We had the best viewing location out of all of the areas on the causeway (viewing areas are labeled A-Z; we were in area F, which was the first of the designated areas where the launch pads were not obscured by vegetation). I asked our NASA Congressional Affairs Rep why we weren't at the Saturn V viewing area, and he said that area is now truly reserved for real VIPs, such as famous people, extended family, or those closely connected with NASA (In fact, when we got back to the mall after the launch, we saw the busses for the people that were taken out the the Saturn V center...they met on the opposite end of the mall, and each received a "swag"

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bag from NASA filled with unknown souvenirs. Each of their busses had a placard in the window reading "Space Shuttle Program Office"). At the site, there is free water, some covered seating areas, concession stands, and a souvenir shop run out of a trailer.

Essentially, all a Congressional NASA VIP Launch Pass will get you these days is a free LTT and a bus ride to and from the event. Don't get me wrong, I do appreciate what they did for me...I figure my senator saved me about \$204 in (when possible). Documentation and tracking software are also available on this system. Element sets (also updated daily) and some documentation and software are available via anonymous ftp from archive.afit.af.mil (129.92.1.66) in the directory pub/space. As a service to the satellite user community, the most current of these elements are uploaded weekly to sci.space.news and rec.radio.amateur.space. (thanks to Michael R. Grabois, orbit@xxxxxxxxxxxxxx)

Brian Rehm (Rehm@xxxxxxxxxxxxxxxxxxxxxx) and others tells us:

<http://spacelink.nasa.gov/Instructional.Materials/Software/Tracking.Elements>

also contains the latest orbital elements. There is also tracking software available here for both Macs and PCs.

There's a list of some 4100+ elements posted weekly at

<ftp://kilroy.jpl.nasa.gov/pub/space/elements/satelem>

You won't find the elements for ALL the objects out there, but you will find a much larger list at <ftp://seds.lpl.arizona.edu/pub/sat/satelem>. The files are UNIX Z-compressed and have over 3000 objects. To decompress them, just leave off the .Z when ftping them.

Eric Kaercher (astyanax@xxxxxxxxxxxxxxxxxx) & Gary Morris (garym@xxxxxxx) writes:

The latest element sets for Shuttle flights and the MIR space station (and someday for Alpha) can be found at <http://www.cts.com/browse/garym/elements>. Elements can also be obtained from several NASA web sites (spaceflight.nasa.gov, spacelink.nasa.gov, oigsysop.atsc.allied.com), ftp sites (garc.gsfc.nasa.gov, archive.afit.af.mil) and other mailing lists (AMSAT's KEPS list, etc).

Thanks to Lynn Tobias (Lynn.Tobias@xxxxxxxxxxxxxxxxxx):

Spacelink has a Space Shuttle orbital element mailing list called STSTLE. To join the list send an email to listproc@xxxxxxxxxxxxxxxxxx with

subscribe STSTLE firstname lastname

in the body of the message. Replace the strings firstname and lastname with your first and last names, respectively.

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Other useful websites for orbital element information are:

<http://www2.satellite.eu.org/sat/seesat/seesatindex.html> (SeeSat-L mail list)
<http://www.mindspring.com/~n2wwd/> (Orbitessera, orbital tracking information)
<http://www.dransom.com/> (STSPLUS, orbit tracking software)
<http://www.idb.com.au/> (Mir/HST/ISS mailing lists)

Teaching Material

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If you are or know a teacher, and they would like some teaching material posters or pictures, have them write to the following address with the pertinent information:

NASA
PA – ESB
Kennedy Space Center FL 32899

To receive the "NASA Report To Educators" and other NASA publications, write to the address below:

Educational Publications Services
Mail Code XEP
NASA Headquarters
Washington DC 20546

Serving inquiries related to space exploration and other activities:

Teaching Resource Center
NASA Jet Propulsion Laboratory
Mail Stop CS-530
4800 Oak Grove Drive
Pasadena CA 91109
(818) 354 6916 Fax: (818) 354 8080

If you're interested a phone number and address you can contact for public information from JPL concerning unmanned planetary exploration:

(818) 354 5011

Public Information Office
NASA Jet Propulsion Laboratory
Mail Stop 186-120
4800 Oak Grove Drive
Pas