“I have a big library at home.”

“Oh, like, a couple of bookcases?...”

“Well, it's a bit more than that...”

Bay 1 (Astrophysics) and 2 (Rocket Launches, Shuttle missions)

Bay 2 and 3 (Rocket launches)

Bay 4 (NASA publications, conference proceedings)

Bay 4, 3, 5 (Reference books), 6 (Periodicals)

Bay 7 (Monographs, ESA publications)

Bay 8 (Astronomy books, other)

Bay 9: Mercury/Gemini/Apollo/Shuttle

Jonathan McDowell's Archive of Astronautics Technical History
Brickbottom Artists Building, Somerville, MA, USA

- Scope: What actually happened in our exploration of outer space?

- What rockets were launched?
- What satellites went into space? What did they do?

My goal is to preserve the technical details of the early space age. What exactly happened on all the early rocket launches and satellite missions?

SIZE: 920 linear feet Space
450 linear feet Astrophysics
500 linear feet History, non fiction, science fiction
Total 1870 l.f. in a 1900 sq.ft apartment

What do I do with it?

- Monthly internet newsletter since 1989

- Web site with the comprehensive list of rocket launches and satellites, extracted from info in the collection

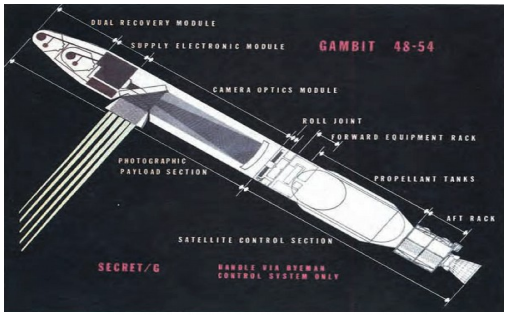
(above two are the ultimate source of much of the spaceflight data in Wikipedia)

- Published articles (if only I had more time)

- The Book (someday)

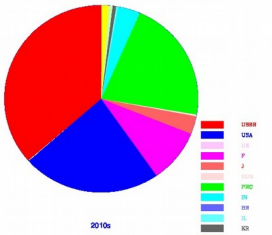
- Answer questions from public, industry, government, media

Some questions I have been asked recently:

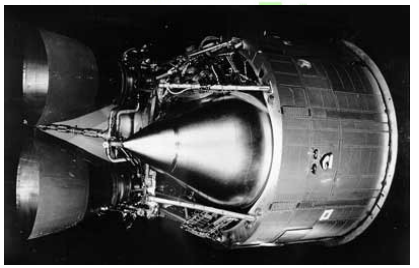


"I'm writing an article on the recently declassified GAMBIT 4352 spy satellite which flew in 1982. What did people figure out at the time?" - academic researcher

"How many countries have launched satellites?" - journalist

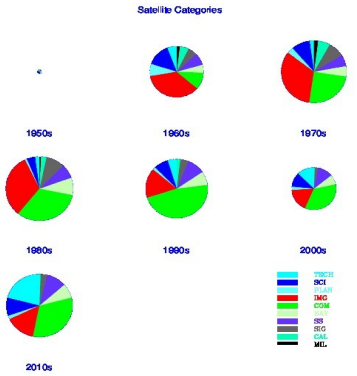


"This Transtage satellite recently disintegrated in orbit; it was launched in 1969. What was its serial number? (so we can call it by its correct name)" - NASA



"What is the difference between Suisei, the 1985 Japanese comet probe, and the Suisei in the name of the new Japanese Mercury mission?" (answer: same transliteration, different Kanji) - me

"What is the fraction of communications satellites now, and back in the 1960s?" - journalist



"Please review this analysis of Chinese space activity in 2014" - US/China Trade Commission

Some media I've talked to recently: BBC, 60 Minutes, io9.com, NPR, …

Collection areas:

Books
- NASA publications — rare, but now mostly available scanned
- European Space Agency — rare
- Astronaut bios — common
- US space program — mostly common
- Russian space program — rare, many Russian language books
- Other space topics — some quite rare; overall collection is extensive but not unique

Journals and magazines
- Trade publications
- Russian magazines
- NASA, ESA periodicals
- British Interplanetary Society

Documents
- Rocket launches — unique collection, uniquely organized
- Organizations and launch sites — unique collection
- US human spaceflight missions — 70% available online, some rare

Problems:

- Government collections (e.g. NASA, NRO) only collect their own stuff, and often lose even that

- Corporate collections (e.g. McDonnell Douglas) often destroyed/lost during mergers

- Academic historians are trained to focus on people and policy. They are usually not interested in robots. Many official histories therefore stop, or at least become highly superficial, once the rocket leaves the pad

- Internal documentation usually extensive during planning phase, but post launch analysis often not well archived, and final fate of a long mission sometimes not well recorded (since team is let go at that point). Bottom line: easier to find what was planned than what really happened

Sources:

Print: Internet
Purchase: Amazon, Abebooks, 2nd hand bookstores
Magazine subscriptions, ebay
Xerox: Academic and observatory libraries

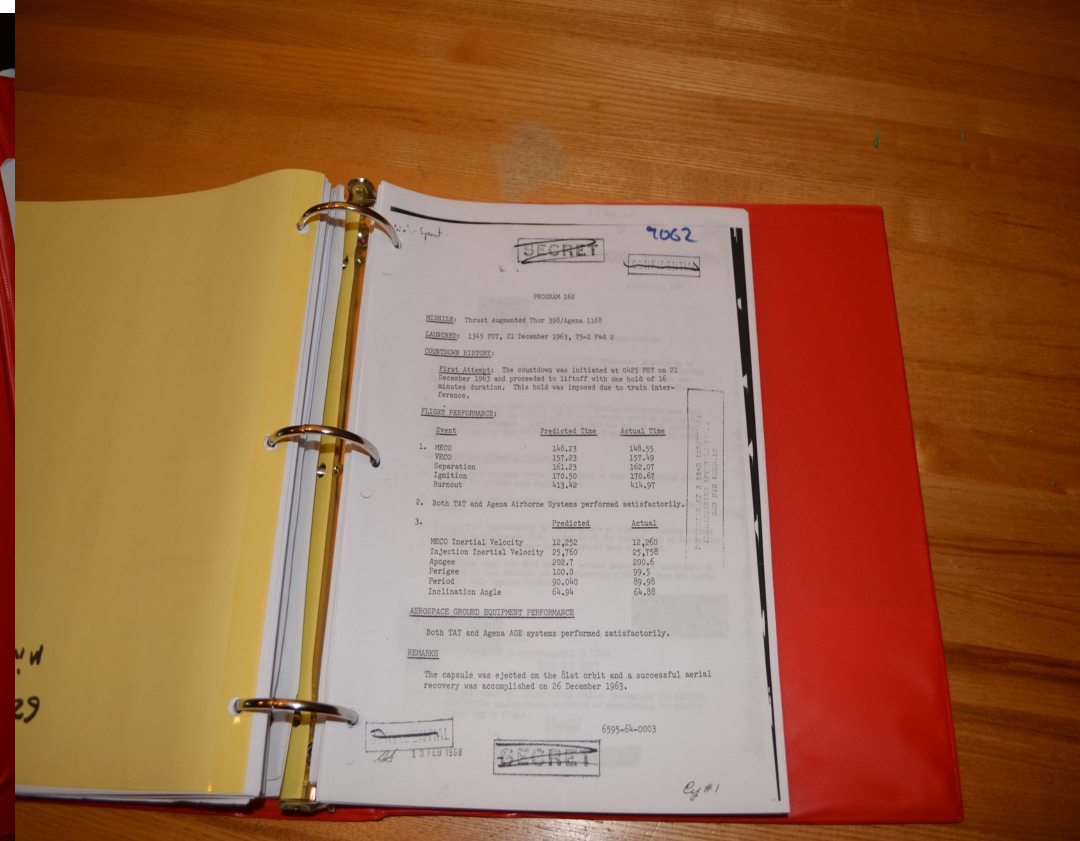
Visit (and xerox): National and institutional archives

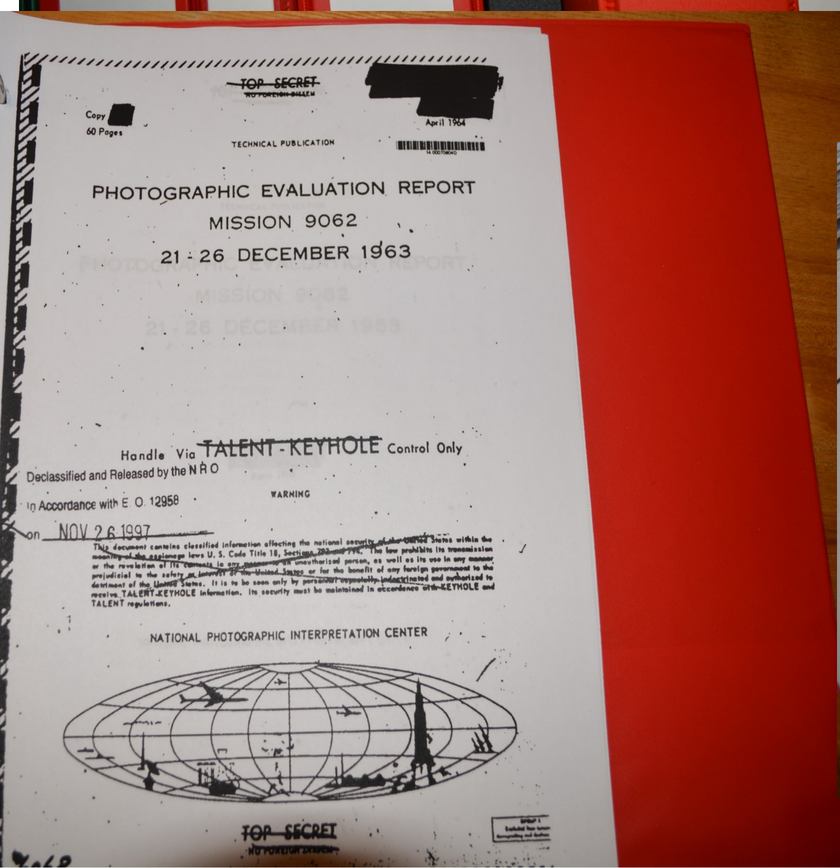
- NatArchives, NASA, NRO, Vandenberg Air Force Base, CNES-Toulouse, ISRO- Bangalore, ISAS-Tokyo, UK Science Museum archive, Deutsches Museum, BUAA-Beijing

Acquire data/email/documents:
Contacts in TsUP-Moscow, NASA-Houston, USAF, Aerospace Corporation, etc.
Harassing phone cold calls to relevant space managers/engineers

Beg, Borrow, Steal, get donated:
Library discard piles
Program managers' bookshelves (with permission)
Retirees' garages


THOR AGENA
1963 JUL-AUG
74-75
9057
L-3
THOR AGENA 1963
1001 9059A
THOR AGENA
1963 OCT-DEC
78-82
1002
9059A
9060
9061
9062
THORAGENA 1964 JAN
POPPY, DMSP
83-84
THOR AGENA
1964 JAN-FEB
ECHO. 1004.F
85-87
THOR AGENA
1964 MAR
88
1003
THOR AGENA 1964 APR
89
THOR AGENA
1964 JUN
90-92

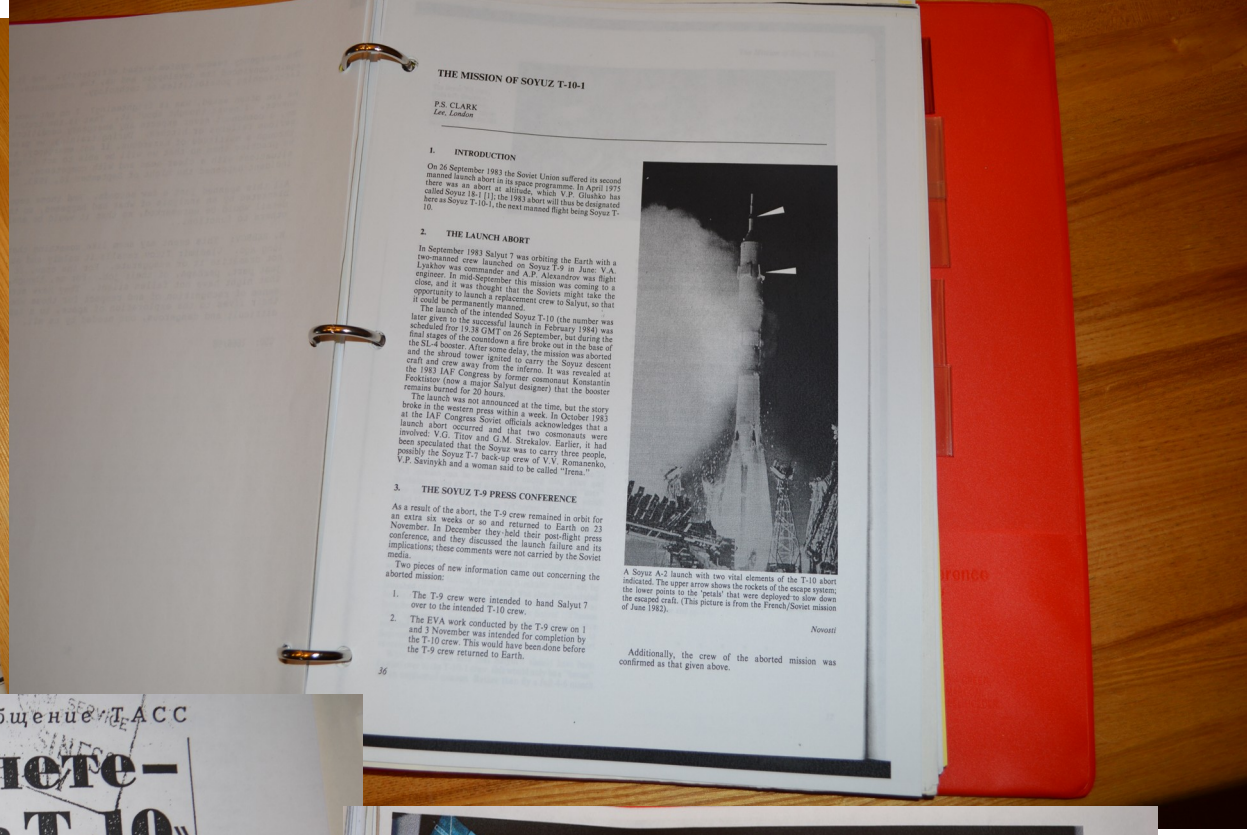

9062
SECRET
CONFIDENTIAL
PROGRAM 162
MISSILE: Thrust Augmented Thor 398/Agena 1168
LAUNCHED: 1345 PST, 21 December 1963, 75-1 Pad 2
COUNTDOWN HISTORY:
First Attempt: The countdown was initiated at 0425 PST on 21 December 1963 and proceeded to liftoff with one hold of 16 minutes duration. This hold was imposed due to train interference.
FLIGHT PERFORMANCE:
Event | Predicted Time | Actual Time
1. MECO 148.23 148.55
VECO 157.23 157.49
Separation 161.23 162.07
Ignition 170.50 170.67
Burnout 413.42 414.97
2. Both TAT and Agena Airborne Systems performed satisfactorily.
3. Predicted | Actual
MECO Inertial Velocity 12,252 12,260
Injection Inertial Velocity 25,760 25,758
Apogee 202.7 200.6
Perigee 100.0 99.5
Period 90.040 89.98
Inclination Angle 64.94 64.88
AEROSPACE GROUND EQUIPMENT PERFORMANCE
Both TAT and Agena AGE systems performed satisfactorily.
REMARKS
The capsule was ejected on the 81st orbit and a successful aerial recovery was accomplished on 26 December 1963.
6595-64-0003
CONFIDENTIAL
13 FEB 1968
SECRET
Cy #1


TOP SECRET
[redacted]
Copy [redacted]
60 Pages
April 1964
TECHNICAL PUBLICATION
PHOTOGRAPHIC EVALUATION REPORT
MISSION 9062
21-26 DECEMBER 1963
Handle Via TALENT-KEYHOLE Control Only
Declassified and Released by the NRO
In Accordance with E.O. 12958
on NOV 26 1997
WARNING
NATIONAL PHOTOGRAPHIC INTERPRETATION CENTER
TOP SECRET


TOP SECRET RUFF
[redacted]
PLOTTABLE PHOTOGRAPHIC COVERAGE

ВЫНОСЯЩИЕ ИЗ ОГНЯ

В НЕБЕ НАД НАМИ



THE MISSION OF SOYUZ T-10-1

P.S. CLARK
Lee, London

1. INTRODUCTION

On 26 September 1983 the Soviet Union suffered its second manned launch abort in its space programme. In April 1975 there was an abort at altitude, which V.P. Glushko has called Soyuz 18-1 [1]; the 1983 abort will thus be designated here as Soyuz T-10-1, the next manned flight being Soyuz T-10.

2. THE LAUNCH ABORT

In September 1983 Salyut 7 was orbiting the Earth with a two-manned crew launched on Soyuz T-9 in June: V.A. Lyakhov was commander and A.P. Alexandrov was flight engineer. In mid-September this mission was coming to a close, and it was thought that the Soviets might take the opportunity to launch a replacement crew to Salyut, so that it could be permanently manned.

The launch of the intended Soyuz T-10 (the number was later given to the successful launch in February 1984) was scheduled for 19.38 GMT on 26 September, but during the final stages of the countdown a fire broke out in the base of the SL-4 booster. After some delay, the mission was aborted and the shroud tower ignited to carry the Soyuz descent craft and crew away from the inferno. It was revealed at the 1983 IAF Congress by former cosmonaut Konstantin Feoktistov (now a major Salyut designer) that the booster remains burned for 20 hours.

The launch was not announced at the time, but the story broke in the western press within a week. In October 1983 launch abort occurred and that two cosmonauts were involved: V.G. Titov and G.M. Strekalov. Earlier, it had been speculated that the Soyuz was to carry three people, possibly the Soyuz T-7 back-up crew of V.V. Romanenko, V.P. Savinykh and a woman said to be called "Irena."

3. THE SOYUZ T-9 PRESS CONFERENCE

As a result of the abort, the T-9 crew remained in orbit for an extra six weeks or so and returned to Earth on 23 November. In December they held their post-flight press conference, and they discussed the launch failure and its implications; these comments were not carried by the Soviet media.

Two pieces of new information came out concerning the aborted mission:

1. The T-9 crew were intended to hand Salyut 7 over to the intended T-10 crew.
2. The EVA work conducted by the T-9 crew on 1 and 3 November was intended for completion by the T-10 crew. This would have been done before the T-9 crew returned to Earth.

A Soyuz A-2 launch with two vital elements of the T-10 abort indicated. The upper arrow shows the rockets of the escape system; the lower points to the 'petals' that were deployed to slow down the escaped craft. (This picture is from the French/Soviet mission of June 1982).

Novosti

Additionally, the crew of the aborted mission was confirmed as that given above.

Пролетарии всех стран, соединяйтесь!

Центральный орган Центрального Комитета КПСС и Верховного Совета СССР

ПРАВДА

Четверг, 9 февраля 1984 года

Цена 4 коп.

Сообщение ТАСС

В полете — «Союз Т-10»

В соответствии с программой исследования космического пространства в мирных целях 8 февраля 1984 года в 15 часов 07 минут московского времени в Советском Союзе осуществлен запуск космического корабля «Союз Т-10», пилотируемого экипажем в составе командира корабля Героя Советского Союза летчика-космонавта СССР полковника Кизима Леонида Денисовича, бортинженера Соловьева Владимира Алексеевича и космонавта-исследователя Атькова Олега Юрьевича.

Программой полета предусматривается стыковка корабля «Союз Т-10» с орбитальной станцией «Салют-7».

На борту комплекса экипажу предстоит выполнить научно-технические и медико-биологические исследования и эксперименты.

Самочувствие космонавтов Кизима, Соловьева и Атькова хорошее. Бортовые системы корабля «Союз Т-10» работают нормально.

ЮБИЛЕИ

25 лет назад впервые в истории космонавтики были осуществлены межорбитальные перелеты с одной космической станции на другую. Выполнили эти уникальные операции космонавты Леонид Кизим и Владимир Соловьёв на корабле «Союз Т-15».

А.Ильин, В.Лындин специально для «Новостей космонавтики»

«Мир» — «Салют-7» и обратно

К 25-летию первого межорбитального перелета

О событиях того времени рассказывает их непосредственный участник — бортинженер корабля «Союз Т-15», а ныне первый заместитель генерального конструктора Ракетно-космической корпорации имени «Энергия» С.П. Королёва, руководитель полета российского сегмента Международной космической станции дважды Герой Советского Союза Владимир Алексеевич Соловьёв (*В.С.*).

В.С.: Программа работ на станции «Салют-7» было не завершена (предыдущим экипажем. – Ред.). Станция продолжала летать с пристыкованным тяжелым грузовым кораблем «Космос-1686», на котором был установлен комплекс «Пион-К» с лазерно-электрон-

еще только готовили к летным испытаниям в беспилотном варианте.

В.С.: Корабль наш был, можно сказать, из «запчастей» собранный. 26 сентября 1983 г. на стартовой позиции загорелась ракета с кораблем «Союз Т», на борту которого находились Владимир Титов и Геннадий Стрекалов. Система аварийного спасения сработала – и космонавты благополучно приземлились. И от этого «Союза» остался спускаемый аппарат – самая сложная часть, ведь на изготовление теплозащиты требуется много времени. Так вот, СА остался и был вполне кондиционным – его и установили на наш «Союз Т-15».

В Центре подготовки космонавтов имени Ю.А. Гагарина уже прошли обучение экипажи для работы на станции «Салют-7», в том числе и по военно-прикладным экспериментам. Но корабль был один!

В.С.: Тогда у Игоря Леонидовича Минюка (он руководил отделом транспортных ко-

Я поехал к Валентину Петровичу, и он рассказал мне про идею перелета с «Мира» на «Салют-7». Потом спросил: «С кем бы вы хотели полететь? У нас две кандидатуры – Кизим и Попов. Вы с Кизимом много летали – не наелись?» Я сказал, что полечу с Кизимом, так как его хорошо знаю и понимаю с полуслова.

Новую орбитальную станцию «Мир» запустили в ночь с 19 на 20 февраля 1986 г. Леонид Кизим и Владимир Соловьёв стали ее первым экипажем. Они стартовали 13 марта 1986 г. и через двое суток прибыли на новую станцию. Их позывной, как и в предыдущем полете, был «Маяк».

В.С.: В этом полете мы все стыковки выполняли вручную. На нашем «Союзе Т-15» стояла старая система стыковки «Игла», а на «Мир» уже установили новую радиотехническую систему «Курс». «Игла» было только со стороны агрегатного отсека, потому что к нему должны были стыковаться

3e PARTIE

TABLEAU CHRONOLOGIQUE DES LANCEMENTS DE FUSEES-SONDES PAR LE C.N.E.S.

N° FU	ENGIN	DATE DE TIR	LIEU	NATURE EXPERIENCE	LABORATOIRE	EXPERIMENTATEURS	COORDONNATEURS
	CENTAURE C 02	6.12.61	REGGAN	EMISSION NA	AERONOMIE	PR. BLAMONT	
	CENTAURE C 06	6.12.61	H.M.G.	EMISSION NA K	AERONOMIE	PR. BLAMONT	
	CENTAURE C 05	9.12.61	REGGAN	EMISSION NA	AERONOMIE	PR. BLAMONT	
	CENTAURE C 07	9.12.61	H.M.G.	EMISSION NA K	AERONOMIE	PR. BLAMONT	
	CENTAURE C 08	9.12.61	H.M.G.	EMISSION NA	AERONOMIE	PR. BLAMONT	
	BELIER B 02	9. 5.62	CERES	TECHNOLOGIQUE	CNET		
	BELIER B 03	15. 5.62	CERES	TECHNOLOGIQUE	CNET		
	BELIER B 04	16. 5.62	CERES	TECHNOLOGIQUE	CNET		
	CENTAURE C 10	18. 5.62	CERES	TECHNOLOGIQUE	CNET		
	VERONIQUE V 39	24. 5.62	H.M.G.	EXPLOSIF	AERONOMIE	PR. BLAMONT	
	CENTAURE C 12	29. 5.62	CERES	EMISSION NA K	AERONOMIE	PR. BLAMONT	
	CENTAURE C 15	29. 5.62	REGGAN	EMISSION NA K	AERONOMIE	PR. BLAMONT	
	CENTAURE C 18	29. 5.62	H.M.G.	EMISSION NA + EXPL.	AERONOMIE	PR. BLAMONT	
	BELIER B 07	29. 5.62	H.M.G.	RADIOACTIVITE	AERONOMIE	PR. BLAMONT	
	VERONIQUE V 38	31. 5.62	H.M.G.	EXPLOSIF	AERONOMIE	PR. BLAMONT	
	VERONIQUE V 41	1. 6.62	H.M.G.	DOUBLE EXPLOSIF	AERONOMIE	PR. BLAMONT	
	VERONIQUE V 42	4. 6.62	H.M.G.	DOUBLE EXPLOSIF	AERONOMIE	PR. BLAMONT	
	CENTAURE C 14	5. 6.62	CERES	EMISSION NA K	AERONOMIE	PR. BLAMONT	
	CENTAURE C 16	5. 6.62	REGGAN	EMISSION NA K	AERONOMIE	PR. BLAMONT	
	CENTAURE C 17	5. 6.62	REGGAN	EMISSION NA K	AERONOMIE	PR. BLAMONT	
	CENTAURE C 19	5. 6.62	H.M.G.	EMISSION NA + EXPL.	AERONOMIE	PR. BLAMONT	
	CENTAURE C 09	5. 6.62	H.M.G.	EMISSION NA K	AERONOMIE	PR. BLAMONT	

4.29GG 63J123

NEWS RELEASE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

WALLOPS STATION, WALLOPS ISLAND, VIRGINIA
TELEPHONE: VALLEY 4-3411 EXTS. 584 and 579

FOR RELEASE: IMMEDIATE
July 23, 1963

Release No. 63-71

SECOND ASTRONOMY EXPERIMENT AT WALLOPS

An experiment carrying instrumentation to measure the intensity of light from the stars was launched by NASA from the Wallops Island, Va., Station at 2:00 a.m. EDT today.

To accomplish its objective, it was necessary to launch the experiment at night when the sun and moon were more than twenty degrees below the horizon. It was also necessary that there be no aurora during the night of launch.

The 238-pound payload was flown on an Aerobee 150A vehicle and reached a peak altitude of 110 statute miles. Impact occurred in the Atlantic Ocean 57 miles from the launch site. No attempt was made to recover the payload. Desired data were telemetered to ground receiving stations during the flight, and will be compared with information obtained from a companion experiment launched early last Friday morning.

The experiment was conducted for NASA's Goddard Space Flight Center, Greenbelt, Md. Theodore P. Stecher was the Goddard Project Scientist, James E. Milligan the Project Manager, and Charles R. Rhodes the Vehicle Manager. Wayne D. Gunter was the Wallops Project Engineer.

- END -

1965ApJ...7..788

63J123 4.29GG

AN OBSERVATION OF JUPITER IN THE ULTRAVIOLET (IV-12)

by Theodore P. Stecher
(Goddard Space Flight Center
National Aeronautics and Space Administration
Greenbelt, Maryland, U. S. A.)

Résumé. — *On a obtenu un spectre ultraviolet de Jupiter (1700-4000 Å, résolution 55 Å) au moyen d'un dispositif photoélectrique. Cet unique document est présenté comme une réflectivité géométrique, laquelle est ensuite supposée due à la diffusion Rayleigh par l'hydrogène moléculaire. On en déduit une limite supérieure de la quantité d'hydrogène moléculaire présente au-dessus de la couche de nuages d'une atmosphère de 11 km atm.*

Abstract. — *A single photoelectric spectral scan of Jupiter in the ultraviolet is presented in the form of a geometric reflectivity. The reflectivity is then assumed to be due to Rayleigh scattering by molecular hydrogen. An upper limit to the amount of molecular hydrogen above the cloud layer of a 11 km atm. is derived.*

Резюме. — Получен ультрафиолетовый спектр Юпитера (1700-4000 Å, разрешение 55 Å) при посредстве фотоэлектрического устройства. Этот единственный в своем роде документ представлен как геометрическая рефлексивность, которая, затем, предположена являющейся следствием релеевского рассеяния молекулярным водородом. Из этого выведен верхний предел количества молекулярного водорода находящегося над слоем облаков атмосферы в 11 км атм.

A single spectral scan of Jupiter in the ultraviolet was obtained from an Aerobee rocket on July 23, 1963 at 06 h 02 mn U. T. The observation was made with an objective grating stellar spectrometer similar to those described by Stecher and Milligan (1962). The spectral range was from λ 1700 to λ 4000 with 55 Angstrom resolution. The instrument had been calibrated in the laboratory prior to flight so that the absolute flux above the earth's atmosphere was obtained at each point in the spectrum. The accuracy of the flux measurement was primarily determined by the noise in signal which was worse than one would like.

The geometrical reflectivity, p, as a function of wavelength is presented in Figure 1. This was obtained by using the solar flux values given by Tousey (1963) and the appropriate Ephemeris values for the necessary geometry. Jupiter was nearly at quadrature when the observation was made.

If we assume Jupiter has a Rayleigh atmosphere in the ultraviolet above the cloud layer, we may immediately obtain upper limits for the column density of any species if the reflectivity is known in terms of optical depth, τ. Using the tables computed by Coulson, Dave and Sekera (1960), curves in the p-τ plane were constructed by numerical integration. Additional curves were obtained for isotropic scattering from the available X-Y functions given by Mayers (1962) and by Sobuti (1963). These were used to approximate Rayleigh scattering for $\tau > 1$.

The total number of atoms or molecules in a cm^2 column perpendicular to the cloud layer is now obtained from $\tau = n\sigma$ under the assumption of only one constituent. Here n is the number of atoms or molecules and σ is the Rayleigh scattering cross section per atom or molecule. The Rayleigh scattering cross section for molecular hydrogen is given by Dalgarno and Williams (1962). In Figure 1 three atmospheres of molecular hydrogen are presented each with the assumption of zero reflectivity for the cloud tops. The 27 km. atm. is that of Spinrad and Trafton (1963) obtained from the H_2 quadrupole bands. The 4.6 km. atm. is that of Zabriskie (1962) which is also from the H_2 quadrupole bands. The 10.5 km. atm. is the one that best fits the reflectivity measurements. An all helium atmosphere which would produce the same reflectivity would be about 200 km. atm. and can probably be ruled out by pressure considerations (Spinrad and Trafton, 1963).

The above analysis is based on coherent scattering. In the case of most molecular gases including molecular hydrogen this is known not to be the case. Raman scattering from H_2 is one-

C.N.R.S. • Provided by the NASA Astrophysics Data System

NC3.134 63 F&S
NC3? 63 Ayg 1

IONOSPHERIC CHEMISTRY

J. C. HOLMES, C. Y. JOHNSON and J. M. YOUNG

E. O. Hulburt Center for Space Research, U.S. Naval Research Laboratory, Washington, D.C., USA

Abstract: Day and night observations of the positive ion composition of the ionosphere between 120 and 230 km were made at White Sands, New Mexico. Certain chemical reactions selected from a list prepared by Nicolet and Swider (1963) were found to be consistent with the experimental observations. Mechanisms for the active production of the night E region are found to be inconsistent with the measurements. An analysis of the day to night decay in the E region suggests that the values of the dissociative recombination coefficients for O_2^+ and NO^+ increase with increasing temperature under those conditions encountered in the ionosphere. It is proposed that simple decay via dissociative recombination may explain the maintenance of the night E region.

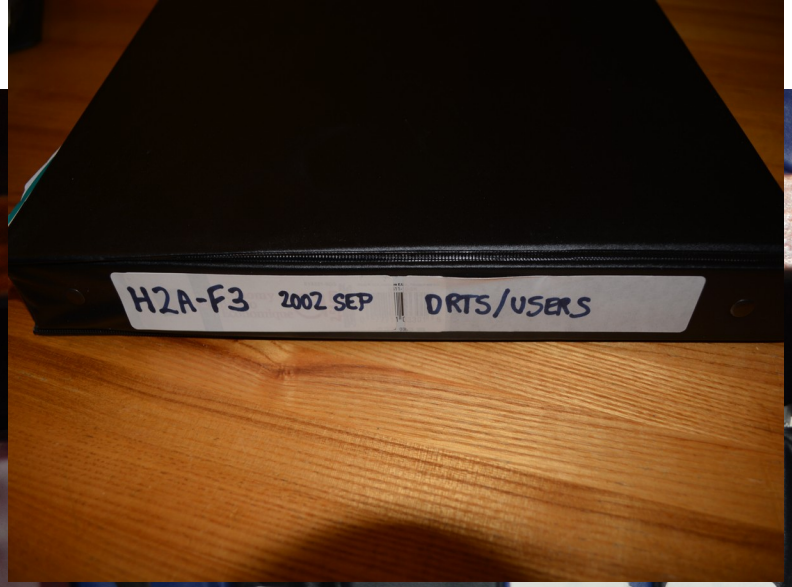
Резюме: Дневные и ночные наблюдения положительных ионов в ионосфере между 120 и 230 км были выполнены в Уайт Сэнде, Нью Мексико. Было установлено, что некоторые химические реакции и среди них разрежения Николе и Свидером (1963) должны соответствовать экспериментальным наблюдениям. Было показано, что механизмы активного образования ночной области несовместимы с измерениями. Анализ перехода от дневной и ночной области Е дает значения коэффициентов диссоциативной рекомбинации для O_2^+ и NO^+ уменьшающиеся с уменьшением температуры. Предполагается, что подобный переход через диссоциативную рекомбинацию может объяснить сохранение ночной области Е.

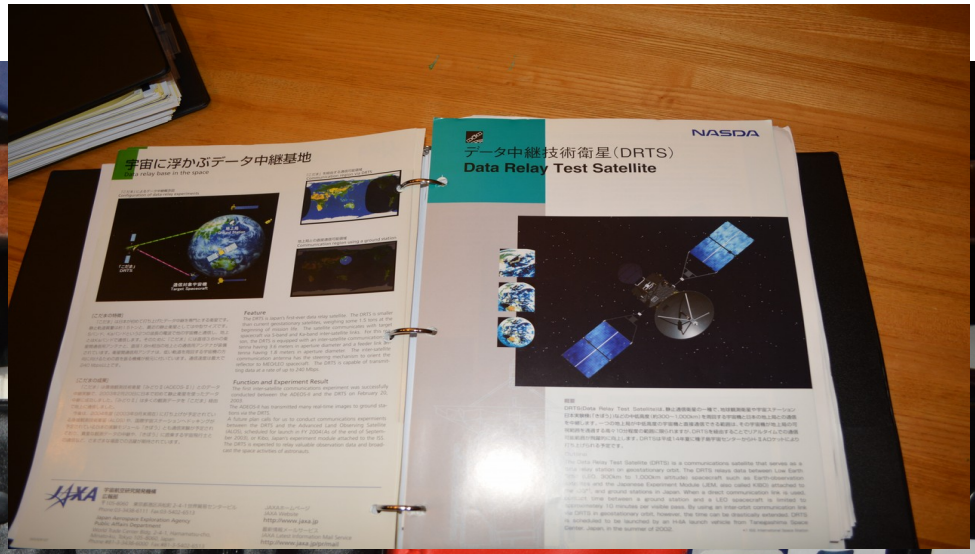
1. Introduction

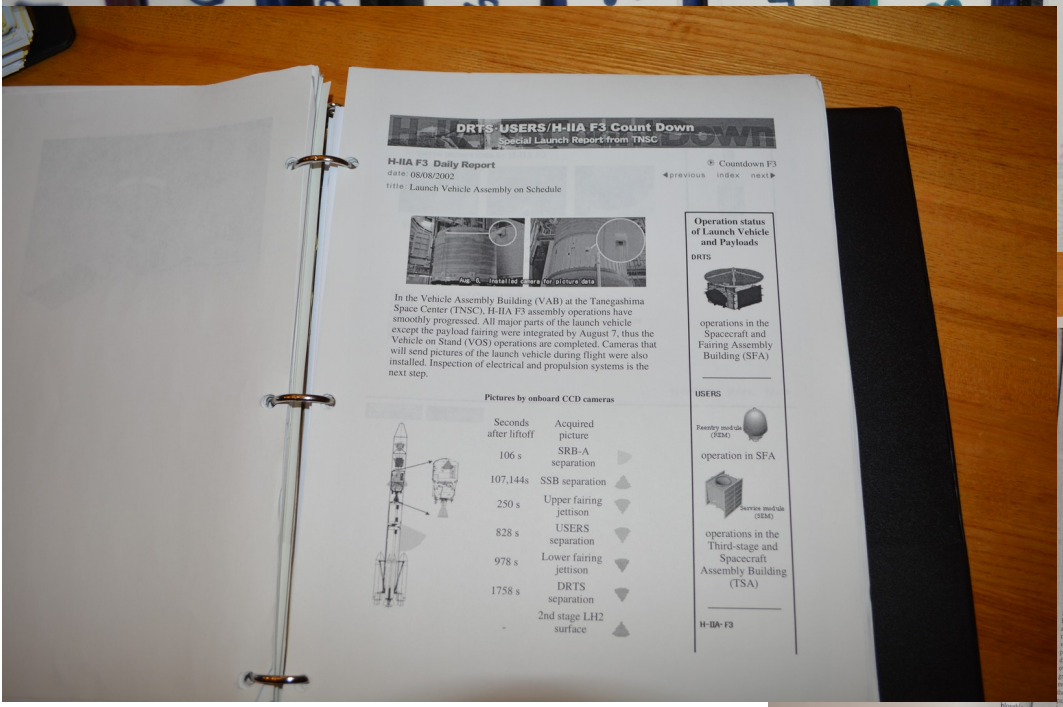
In 1963, two rockets instrumented with Bennett mass spectrometers were flown at White Sands, New Mexico; the first flight took place at 0934 MST on February 15. The mass spectrometers were recovered by parachute, checked in the laboratory and reflown on a second rocket at 0106 MST on 1 August. Ionospheric positive ion composition and density data were obtained for both day and night.

2. Daytime data

Figure 1 shows the result of the daytime flight. The total ion current measured by each spectrometer was normalized to the total electron density






DRTS-USERS/H-IIA F3 Count Down
Special Launch Report from TNSC

H-IIA F3 Daily Report
date: 08/08/2002
title: Launch Vehicle Assembly on Schedule

◉ Countdown F3
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In the Vehicle Assembly Building (VAB) at the Tanegashima Space Center (TNSC), H-IIA F3 assembly operations have smoothly progressed. All major parts of the launch vehicle except the payload fairing were integrated by August 7, thus the Vehicle on Stand (VOS) operations are completed. Cameras that will send pictures of the launch vehicle during flight were also installed. Inspection of electrical and propulsion systems is the next step.

Pictures by onboard CCD cameras

Seconds after liftoff	Acquired picture
106 s	SRB-A separation
107,144s	SSB separation
250 s	Upper fairing jettison
828 s	USERS separation
978 s	Lower fairing jettison
1758 s	DRTS separation
-	2nd stage LH2 surface

Operation status of Launch Vehicle and Payloads

DRTS

operations in the Spacecraft and Fairing Assembly Building (SFA)

USERS

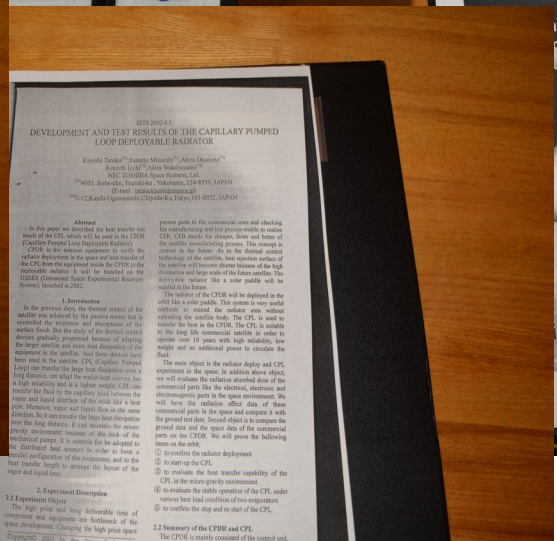
Reentry module (REM)

operation in SFA

service module (SEM)

operations in the Third-stage and Spacecraft Assembly Building (TSA)

H-IIA F3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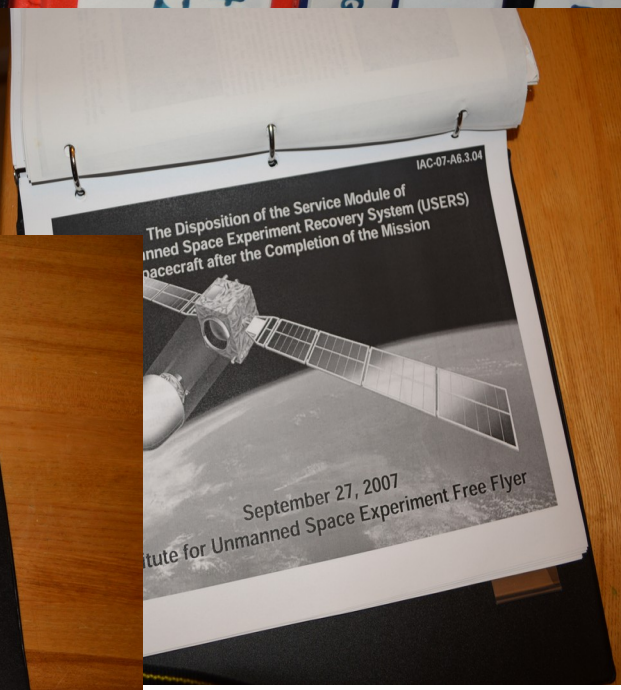
DEVELOPMENT AND TEST RESULTS OF THE CAPILLARY PUMPED LOOP DEPLOYABLE RADIATOR


The Disposition of the Service Module of nned Space Experiment Recovery System (USERS) pacecraft after the Completion of the Mission

September 27, 2007

tute for Unmanned Space Experiment Free Flyer

THANK YOU!!

Idiosyncratic indexing system

0001 General
0010 Human spaceflight
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  e.g. 0045.6 – Space Tethers
       0047 - spacesuits
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