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FOREIGN TECHNOLOGY DIVISION

AIR FORCE SYSTEMS COMMAND

THE VALUE OF AN ORBITAL MINUTE

by

V. Smirnov

FOREIGN TECHNOLOGY DIVISION

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THE VALUE OF AN ORBITAL MINUTE

By: V. Smirnov

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U. S. BOARD ON GEOGRAPHIC NAMES TRANSLITERATION SYSTEM

Block	Italic	Transliteration	Block	Italic	Transliteration
А а	*А а*	A, a	Р р	*Р р*	R, r
Б б	*Б б*	B, b	С с	*С с*	S, s
В в	*В в*	V, v	Т т	*Т т*	T, t
Г г	*Г г*	G, g	У у	*У у*	U, u
Д д	*Д д*	D, d	Ф ф	*Ф ф*	F, f
Е е	*Е е*	Ye, ye; E, e*	Х х	*Х х*	Kh, kh
Ж ж	*Ж ж*	Zh, zh	Ц ц	*Ц ц*	Ts, ts
З з	*З з*	Z, z	Ч ч	*Ч ч*	Ch, ch
И и	*И и*	I, i	Ш ш	*Ш ш*	Sh, sh
Й й	*Й й*	Y, y	Щ щ	*Щ щ*	Shch, shch
К к	*К к*	K, k	Ъ ъ	*Ъ ъ*	"
Л л	*Л л*	L, l	Ы ы	*Ы ы*	Y, y
М м	*М м*	M, m	Ь ь	*Ь ь*	'
Н н	*Н н*	N, n	Э э	*Э э*	E, e
О о	*О о*	O, o	Ю ю	*Ю ю*	Yu, yu
П п	*П п*	P, p	Я я	*Я я*	Ya, ya

*ye initially, after vowels, and after ъ, ь; e elsewhere. When written as ё in Russian, transliterate as yё or ё. The use of diacritical marks is preferred, but such marks may be omitted when expediency dictates.

GREEK ALPHABET

Alpha	Α	α	ɑ	Nu	Ν	ν	
Beta	Β	β		Xi	Ξ	ξ	
Gamma	Γ	γ		Omicron	Ο	ο	
Delta	Δ	δ		Pi	Π	π	
Epsilon	Ε	ε	ϵ	Rho	Ρ	ρ	ϱ
Zeta	Ζ	ζ		Sigma	Σ	σ	ς
Eta	Η	η		Tau	Τ	τ	
Theta	Θ	θ	ϑ	Upsilon	Υ	υ	
Iota	Ι	ι		Phi	Φ	φ	ϕ
Kappa	Κ	ϰ	κ ϰ	Chi	Χ	χ	
Lambda	Λ	λ		Psi	Ψ	ψ	
Mu	Μ	μ		Omega	Ω	ω	

RUSSIAN AND ENGLISH TRIGONOMETRIC FUNCTIONS

Russian	English
sin	sin
cos	cos
tg	tan
ctg	cot
sec	sec
cosec	csc
sh	sinh
ch	cosh
th	tanh
cth	coth
sch	sech
csch	csch
arc sin	$\sin^{-1}$
arc cos	$\cos^{-1}$
arc tg	$\tan^{-1}$
arc ctg	$\cot^{-1}$
arc sec	$\sec^{-1}$
arc cosec	$\csc^{-1}$
arc sh	$\sinh^{-1}$
arc ch	$\cosh^{-1}$
arc th	$\tanh^{-1}$
arc cth	$\coth^{-1}$
arc sch	sech^{-1}
arc csch	csch^{-1}

Russian	English
rot	curl
lg	log

GRAPHICS DISCLAIMER

All figures, graphics, tables, equations, etc. merged into this translation were extracted from the best quality copy available.

THE VALUE OF AN ORBITAL MINUTE

Our Special Correspondent's Report from the Flight Control Center

V. Smirnov

An orbiting space station distinguishes itself to advantage from ordinary spacecraft precisely by the fact of its ability to remain in space for long periods of time. "Salyut-4" has now been in orbit over six months. The second crew has now been at work on board for eight weeks. Why, exactly, do the scientists and various system specialists "divide" each minute among themselves when they plan their work program?

As always, time remains the scarcest factor. This stands to reason, of course. The operators of a piece of research equipment or a system try to squeeze all they can out of it. However, the technical and energy resources of the station are not unlimited. For example, scientists using telescopes, spectrometers, and photo cameras are studying radioactive stellar emissions and solar processes; they want to make every effort to maintain the space station in a certain orientation. In addition, the specialists who are responsible for the station's "reliability" must be concerned about the most conservative expenditure of fuel reserves, of the "working body". The doctors who maintain the health of the cosmonauts try to organize the workday in such a way that the crew will have enough time for physical exercises, rest, and sleep. So, the problem is to make the most rational and advantageous use of the human resources as well.

These examples demonstrate certain obvious contradictions which, incidentally, characterize any space experiment. However, these contradictions are not antagonistic. In the first place, P. Klimuk and V. Sevast'yanov more than once did extra work on their own initiative and asked permission to undertake unplanned studies in their free time. The point is, however, that it is contradictions such as these which prompt designers and scientists to make additional improvements in space systems and orbiting stations, in their equipment and research apparatus.

The results of the flight of "Salyut" and the activities of its two crews have been, in the view of the specialists, highly valuable for determining potential possibilities of the technology and personnel who make extended space flights. Each new [flight? - TR] confirms the fact that the most important problem to be solved consists of arranging enough time for the cosmonauts to perform the tasks calling for the greatest skills. Conditions must be created which will allow them to spend their literally golden time most productively. This also forces the engineers and designers to make constant efforts to improve methods of flight control and the design of the instruments and aggregates of the orbiting station so that the human effort can be devoted only to those operations which cannot be performed automatically by machine.

In this regard we may consider as an example the autonomous navigation system used on "Salyut-4" in its experimental form. It is designed in particular to relieve cosmonauts in the future from the routine operations of receiving and sending radio messages with information on the station's orbit parameters and predictions of its future movements. The navigation system, which includes a computer, will provide on-board calculations of orbit elements, predict changes in it, and indicate the times during a 24-hour period for observations of certain stars for the purpose of orienting the station and the instant at which to open the shutter of the photo camera or spectrograph.

A check of the basic operational principles of the "Salyut-4" navigation system confirmed their vitality. The future presents the task of combining it with the orientation system, thereby automating the flight control of the orbital station.

There are, of course, situations which arise which even the most "intelligent" automatic machine cannot anticipate. Such was the case, for example, when during the flight of "Salyut-4", the crew observed silvery clouds and undertook a study of them. In cases like this only a person can decide quickly what has to be done, how and with what to photograph, and which instruments to acitvate.

Such situations also include those involving repairs and preventive maintenance in space. Experience with manned flight shows that cosmonauts must know how to repair technical equipment on board. Scientific and design groups in our country are developing special instruments for use in the specific conditions of weightlessness on board orbiting stations. Such will also be used in the future for conducting various types of technological experiments in space.

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