

WESTPAC satellite orbital parameters and measurements accuracy.

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1. Initial stage: Preparation to the WESTPAC launch

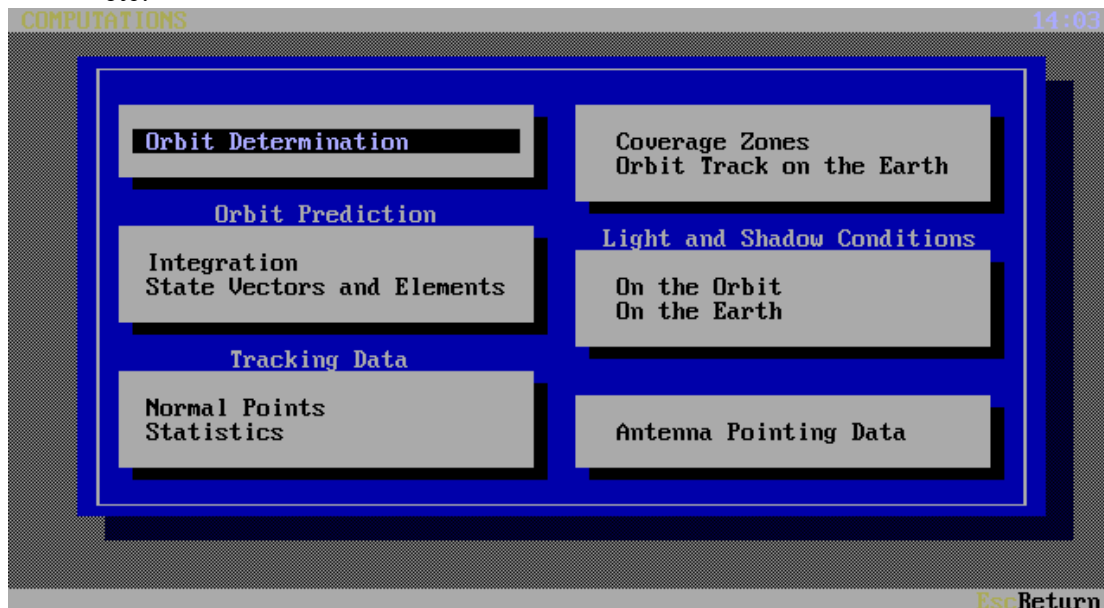
Main tasks:

- preparation and adaptation of HW and SW of MCC for WESTPAC launch
- experimental work of MCC tools and technology basing on real SLR data (Zeia, Stella etc.)

Hardware: (the property of WPLTN):PC Pentium-200, Pentium-166

Software: **The STARK Software package** (designed in MCC)

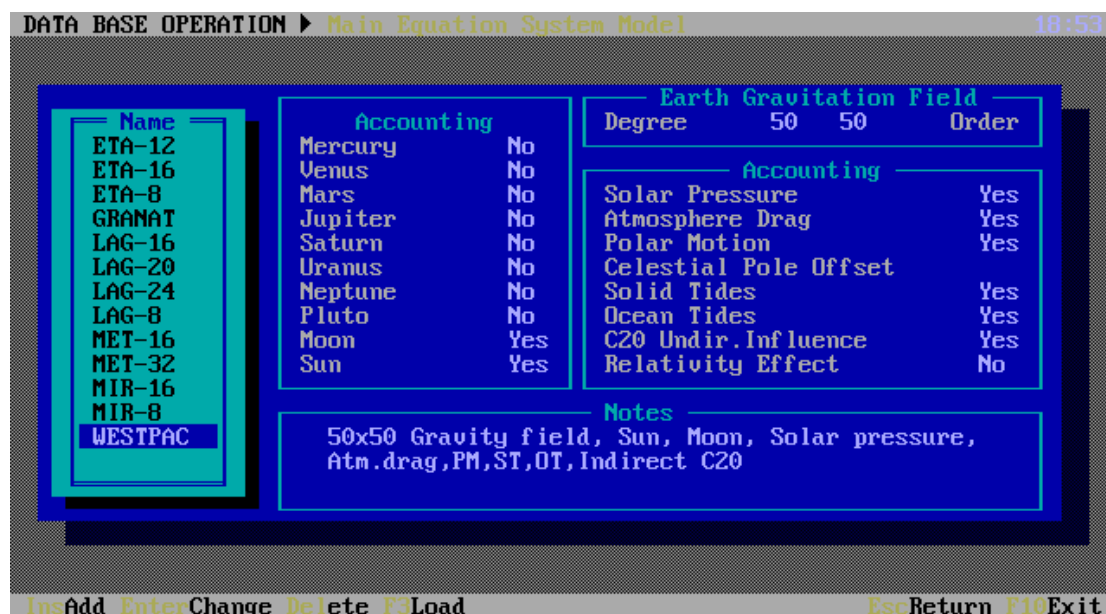
- orbit determination
- orbit prediction
- IRVS, TBF and Drag function production
- ground station coverage zones computation
- light/shadow conditions on the Earth and on orbit
- antenna pointing data for tracking facilities
- '2/3-dimensional' orbit representation screening
- orbit predictions comparison
- tracking data estimation
- etc.



STARK SW: COMPUTATION menu.

Dynamic model of the spacecraft includes:

- Earth gravitation field (Russian GPZ-85, GPZU-90 of 36-th order and degree; GEM-T1, GEM-T3 of 36-th order and degree, JGM-2, JGM-3 of 70-th order and degree)
- Atmospheric drag (Russian model on the real sets of the geomagnetic activity indexes and solar activity indexes)
- Perturbations due to Sun, Moon and planets
- Tides of solid earth
- Ocean fides
- Polar motion and UT1-UTC correction
- Relativity effects
- Indirect influence of the earth ablation
- Direct Solar radiation pressure
- Effect of earth albedo
- Geometry of spacecraft
- Unsimulated (empirical) acceleration



STARK SW: Main Equation System Model.

STARK SW testing for WESTPAC launch

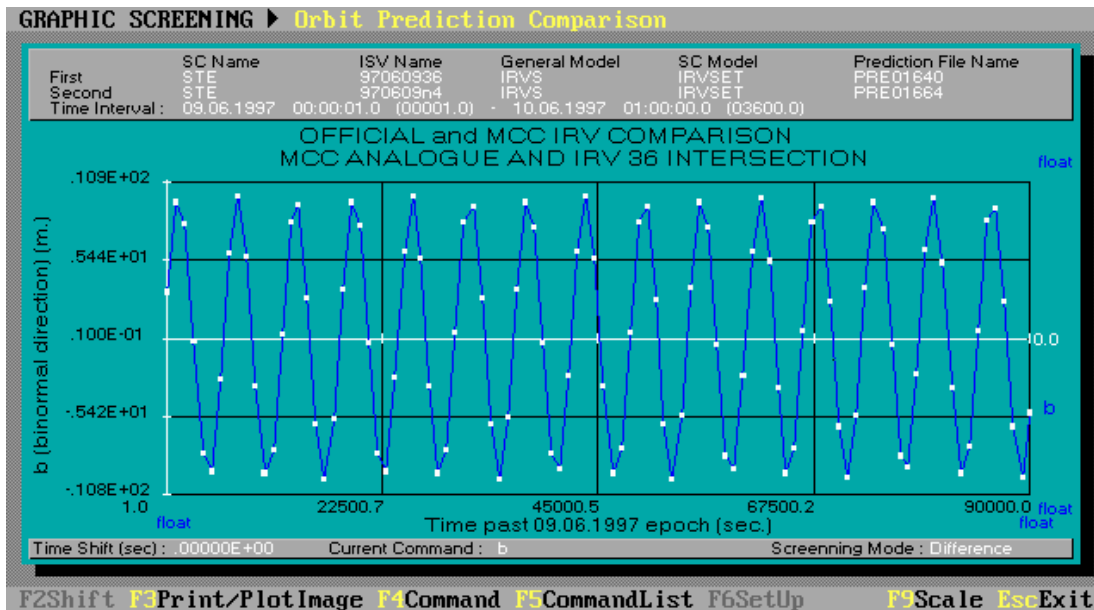
- experimental work based on real GFZ-1 SLR data
- using original testing calculation results (in the step by step mode) received by e-mail directly from A. Sinclair and R. Wood
- in frame of the Zeia mission support
- by comparison of the some MCC and Official (ATSC) Centers results by STELLA orbit prediction/analysis

The result of the initial stage and STARK SW testing

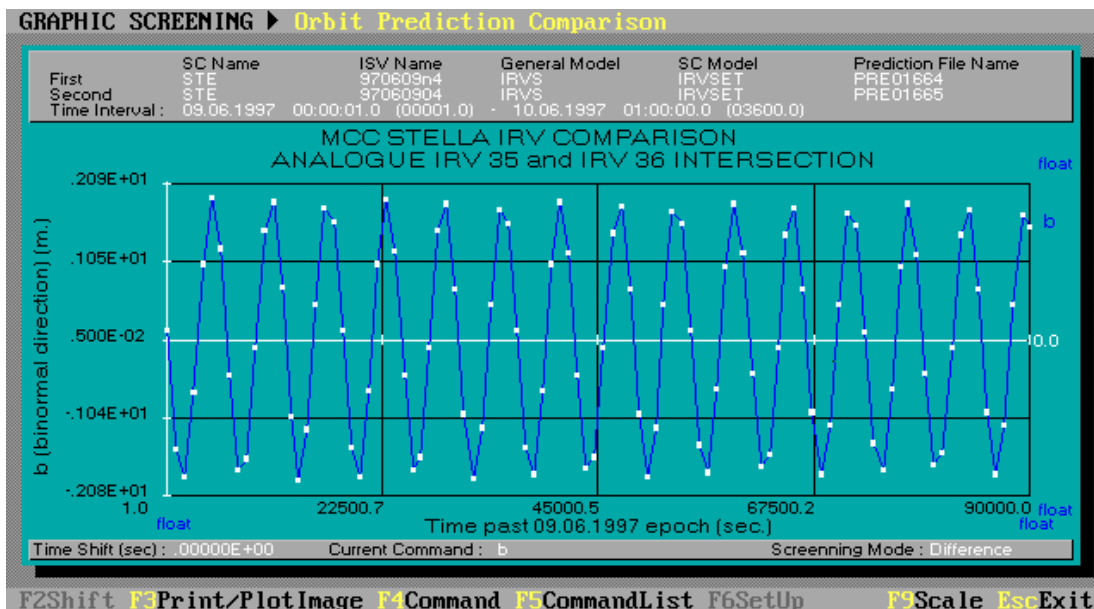
- Preparation of the two reports:

- „Adaptation of basic LOAC (MCC) software for the support of the WESTPAC mission“
- „Comparison of LOAC (MCC) and other Centers results on the real SLR data processing“

**The analysis of the difference across orbit
for Stella (MCC and ATSC IRVS)**



The difference across orbit for MCC analogue IRV36 and IRV36.

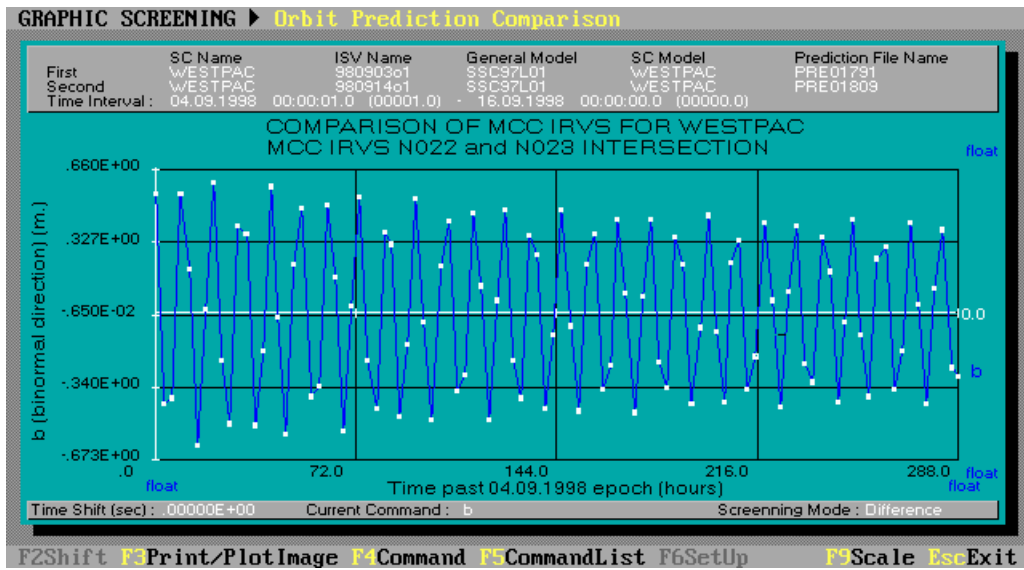


The difference across orbit for MCC analogue IRV 35 and 36.

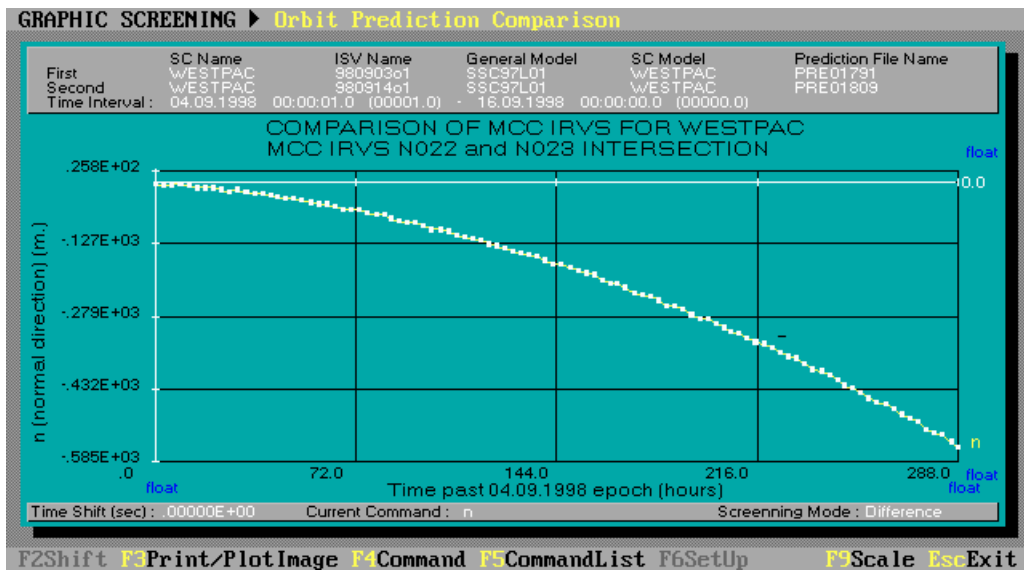
2. Second stage: WESTPAC launch and identification

Checking hypotheses	Results	Date
1. „Nominal“ version	No returns	10.07
2. „RESURS and WESTPAC together“ (unseparated)	No returns	11.07 - 12.07
3. „Constant brightness“ of the satellite before RESURS (right idea, but on the base of RESURS IRVS)	No returns (bad tracking)	12.07 - 13.07
4. „NORAD version“ - the first SLR orbit - improving of the SLR orbits - the good IRVS and orbit quality (automatic- and daytime- tracking in Yaragadee) - precise prediction to the separation moment	returns from Kaziveli and Riga	14.07 - 15.07 16.07 17.07 - 21.07 19.07
5. Version N 3 (on the base of NORAD data and improving SLR orbits)	first returns from Riga and Maidanak returns from Grasse and Kaziveli	23.07 - 24.07 29.07

The difference of MCC IRVS N022 and N023 for WESTPAC



The difference across orbit.



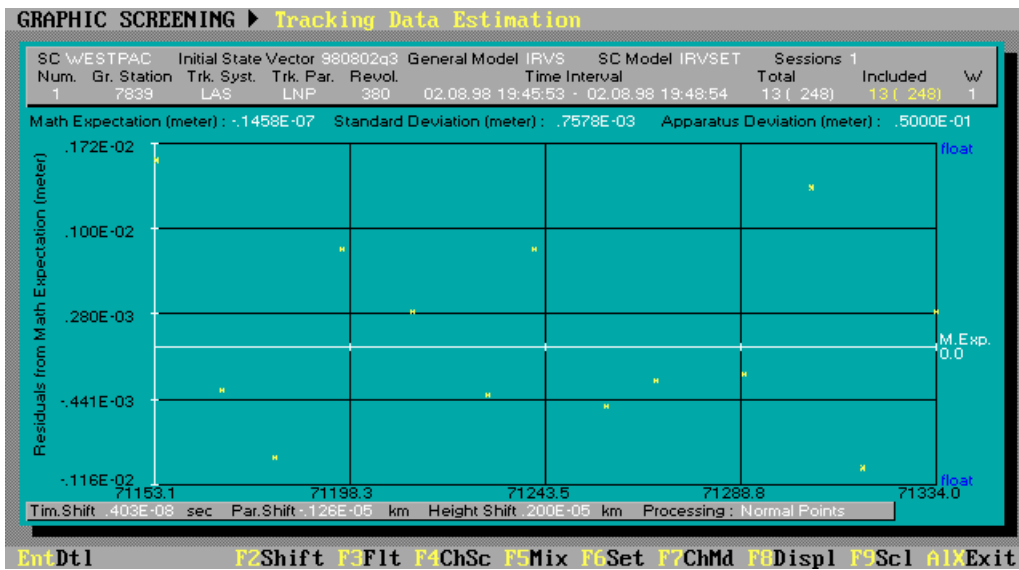
The difference along orbit.

3.Current stage: SLR orbits and measurements analysis

Main tasks:

- precise IRVS production based QL-NP SLR data
- SLR orbits and predictions analysis
- SLR tracking data estimation and analysis

The measurements accuracy analysis (examples)



SUMMARY

- The current SLR data analysis results confirm the submillimeter-range target error of the WESTPAC satellite
- Combined processing of the WESTPAC and STELLA SLR data will provide more information on fine details of the Earth gravity field as well as on the atmospheric drag
- Further investigations are necessary based on FR data obtained by the worldwide SLR network, including data obtained at different wavelengths
- After the successful launching of this satellite, the worldwide laser ranging network has an SLR target having target errors far less than the current instrumental errors of SLR stations plus the atmosphere refraction uncertainties and data processing errors. It may therefore stimulate the equipment upgrading as well as development of better methods of reduction of the error components caused by the atmosphere and processing.