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# **CST CAPABILITIES**

## **COMMERCE**

MARKETING AND TRADING TECHNICAL EQUIPMENT

MANAGEMENT, REPRESENTATION AND LOGISTICS

## **CONSULTANCY**

SPACE TECHNOLOGIES AND PLANNING

RESOURCE PROSPECTING BY REMOTE SENSING

## **LAUNCHERS**

LAUNCHER SERVICES BROKERING

LAUNCH SOLUTIONS PROVISION



# EVOLUTION OF CAPABILITIES

- 1983**      **CONSULTANCY begins**  
**UK Customers only (insurance, BNSC, etc)**
- 1987**      **First business in Russia (via customer in Finland, Brokering of Soviet launches)**
- 1991**      **Collapse of Soviet Union**  
**Employment of Russian nationals possible**
- 1993**      **Brokering of FSU small launchers begins**  
**(begun as adjunct to consultancy)**
- 1995**      **First launch (for SSTL) of Fasad Alfa on Tsyklon from Plesetsk**
- 1999**      **Registration of CST Moscow office**
- 1999**      **First Dnepr launch**
- 2000**      **First SSO Cosmos Launch (negotiated by CST for Tsinghua 1 +Snap)**
- 2004**      **First Dnepr to SSO**
- 2010**      **Launch of PICARD. 24<sup>th</sup> satellite managed**
- 2011**      **Management of projects in Russia begins (Canopus)**
- 2012**      **Launch of ADS-1B. Soyuz/Fregat (with Kanopus-V and BKA)**
- 2014**      **Launch of KazEOSat-2. Dnepr rocket (1 in cluster)**
- 2014**      **Launch of TechDemoSat-1 (TDS-1, UKube-1. Soyuz/ Fregat rocket )**
- 2017**      **Launch of Kanopus-V-IR as a main payload, Planet's (USA) Flock-2k - 48 Dove CubeSats constellation**



# MARKETING AND TRADING

Space activity naturally demands political as well as high technology skills and contacts. CST was founded in October 1983 and has therefore been operating in this highly demanding field for 34 years, much of which have been spent in the rewarding but idiosyncratic Russian space field. As a consequence of this, CST has begun to successfully and profitably trade general high technology products to and from the Russian Federation and can offer this experience to others. Thus:

- CST **contacts** are at the right level to get things done
- CST has a large and adequate fund of **technical expertise** which can be drawn from its consultancy and launching services
- Also from its other activities, CST has developed the key **‘cultural-interpretation’** skills, the importance of which is often neglected by others
- CST is also able to offer the vital **logistical support** necessary for success with translation, accommodation, minding, secretarial and on the spot representation.

**A typical development** in this sector is the facilitation and management of international projects. An example is the Canopus project, the satellites of which are to be launched this year.



# MANAGEMENT AND REPRESENTATION - 1

## INSIDE RUSSIA

- Many non-Russian companies run representational offices in Moscow. When not connected with mass market domestic requirements, these offices can be expensive to run for the results produced.
- CST has had a representational office in Moscow for 25 years and has built a presence with its Russian contacts and partners which would require considerable expense and effort by fresh entrants.
- Thus, CST can fully represent its Western partners in Russia and other former Soviet Union countries from the most important centre, Moscow, not only by making their presence felt but by helping to avoid the traps and delays.



# MANAGEMENT AND REPRESENTATION - 2

## OUTSIDE RUSSIA

- Over its 25 years of presence in Moscow, CST has partnered or done business with nearly all the major players in the Former Soviet Union as well as the newcomers from 1991.
- For Russian, Ukrainian and Kazakh partners CST has for many years been undertaking representational services apart from those involved in the provision of launcher services.
- Currently CST is managing projects involving the marketing of components services and expertise as well as the joint manufacture of space technology products such as satellites.



# COMMERCIAL RESOURCE PROSPECTING BY REMOTE SENSING - 1

Satellite data, if properly used is a very cost effective way of reducing exploration risk and increasing commercial return.

CST consultancy in oil, gas and mineral resources (including water) exploration offers key skills in the selection and interpretation of satellite data and the integration of this data with conventional drilling, seismic, gravity and magnetic mapping results.

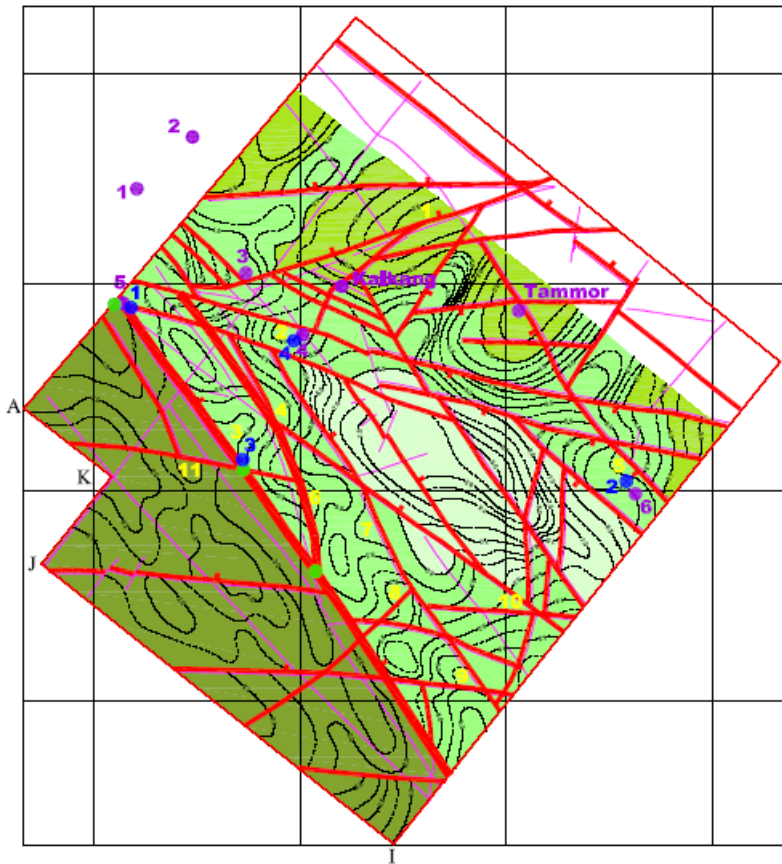
CST experts have worked with most of the international oil and gas majors and CST partners are drawn from Russian centres of excellence in remote sensing and geology

The unique combination of talents employed enables CST to offer very promising and hitherto untried methods of combining remote sensing with existing geophysical data for the exploration of difficult onshore regions.

Customers are invited to discuss objectives, scope and deliverables for projects of any size with CST experts.



# COMMERCIAL RESOURCE PROSPECTING BY REMOTE SENSING - 2



CST experts and partner institutions have a proven track record of successful oil, gas and Mineral resources, including water, exploration.

The figure shows an example of the location of prospective areas for further oil & gas detailed survey, and/or drilling, according to remote sensing indications, arrived at by CST analysis.

The locations of these areas are superposed on a map of the “Top Main Hydrocarbon Reservoir” for this onshore area which has been derived by full integration of the satellite data interpretation with detailed ground-based geological knowledge & conventional seismic mapping .





# LAUNCH SERVICES BROKERAGE

CST has developed the full range of contacts and methodology necessary for customers wishing to use FSU launchers

## History of CST launch arrangements

| YEAR | DATE         | LAUNCHER (MODE)              | SATELLITE(S)   |
|------|--------------|------------------------------|--|
| 1995 | August 31    | Tsyklon (1 piggy-back)       | Fasat Alpha  |
| 1998 | July 10      | Zenit (2 piggy-back)         | Fasat Bravo + TM Sat   |
| 1999 | April 21     | Dnepr (1 dedicated)          | Uo Sat 12 (first commercial use of SS-18)  |
| 2000 | June 28      | Cosmos (2 piggy-back)        | Tsinghua 1 +Snap (first SSO flight of Cosmos)  |
| 2000 | September 26 | Dnepr (1 piggy-back)         | Tiung Sat  |
| 2002 | November 28  | Cosmos (main in cluster)     | Alsat-first Disaster Monitoring Constellation (DMC)                                      |
| 2003 | September 27 | Cosmos (3 in cluster)        | NigeriaSat-1, BilSat-1 and UK-DMC (all DMC)  |
| 2004 | June 29      | Dnepr (main in cluster)      | Demeter (CNES, first SSO flight of Dnepr)  |
| 2005 | October 27   | Cosmos (3 in cluster)        | TopSat, ChinaSat (DMC), SSETI Express+cubesats   |
| 2008 | August 29    | Dnepr (5 in cluster)         | RapidEye constellation   |
| 2009 | July 29      | Dnepr (2 in cluster)         | UK-DMC2 + DEIMOS-1 (both DMC)  |
| 2009 | September 17 | Soyuz/Fregat (1 piggy-back)  | SumbandilaSat (South Africa, first piggy-back from this launcher combination)            |
| 2010 | June 15      | Dnepr (1 of a pair)          | Picard (CNES, paired with Prisma)  |
| 2011 | August 17    | Dnepr (2 in cluster)         | NigeriaSat-2 and NigeriaSat-X  |
| 2012 | July 22      | Soyuz/Fregat (1 piggy back)  | ADS-1B   |
| 2014 | June 19      | Dnepr (1 in cluster)         | KazEOSat-2   |
| 2014 | July 8       | Soyuz/ Fregat (2 piggy back) | TechDemoSat-1 (TDS-1), UKube-1   |
| 2017 | July 14      | Soyuz-2.1a/Fregat            | Kanopus-V-IR as a main payload, Planet's (USA) Flock-2k - 48 Dove CubeSats constellation |



## WHY BROKER?

When booking a ticket for a particular destination, we are not often concerned with the make of the vehicle, whether car, train, ship or aircraft, but with the quality of the service provided for the price of the ticket. We are also very much concerned with the difficulty of obtaining the ticket, the reliability of the booking agency, the information it provides and the reliability of the transportation system itself. We also worry about whether we have made the right choice and whether there may have been a better one.

The last point is particularly relevant to the space sector where no general brokers, equivalent to a terrestrial travel agency, exist. Luckily, the FSU has a sufficient variety of launchers to enable such a service to work. From 1995, the launches of 81 small satellites have been managed so far on 5 different launch vehicles. SSTL is CST's most important customer and uses CST's full service which runs from the initial competitive tendering exercise to the management of the launch campaign.

Brokering improves the business of all parties, including the launcher providers.



## CST BROKERAGE SERVICES INCLUDE

- **Launcher brokerage** in a straight forward way ‘across the board’ for both ‘piggy-back’ and dedicated launch services achieving the best achievable prices and conditions.
- **Local management** on the spot and the conducting of progress meetings and handling bureaucratic processes for clients, can save a great deal of time and money for clients.
- **Contract services** include CST’s interpretation and translation skills as well as its understanding of the Russian approach, which is vital for support in all technical and programmatic meetings.
- **Consultancy services** on all aspects of FSU space industry and technology which enable potential customers to assess the technologies, stocks, associations, current situation and ability to do business of the organisations that they wish to deal with.
- **Insurance** and other financial services can be arranged because of CST’s experience with consultancy work for financial, legal and insurance groups in London and Moscow.



# CST LAUNCH SERVICES BROKERAGE ACHIEVEMENTS

- 81 satellites have been launched so far.
- CST is contracted for the brokerage and management of launching services for many more satellites on several different launchers over the next 3 years and negotiating others beyond that time.
- All current types of FSU launchers are brokered. So far, CST has managed launches on 5 different launchers.
- CST has negotiated several pioneering contracts such as the first Dnepr launch, first Cosmos to SSO, first Dnepr to SSO, etc.
- Further innovation will be introduced over the next 5 years, both in style of service and with the new launchers that will be introduced.



## **THE EXPERIENCED CST RUSSIAN TEAM CAN FACILITATE**

- Customs clearance & transportation of satellite & equipment to cosmodrome
- Payment stages: CST can negotiate a better payment spread, together with more easy transferral terms than usually asked and also arrange for work to begin when the money leaves the clients bank.
- Launch price negotiations - we have often negotiated worthwhile reductions on the last 'firm' offer to the customer.
- Logistics of staying in Baikonur or Plesetsk for launch preparation are taken care of.
- Translation, interpretation and escort services.
- The vital step of negotiating the launch services agreement (LSA) is handled firmly and in an optimum way by CST since it has a friendly working relationship with all Russian and Ukrainian launching organisations.
- Compromises are needed at all stages of launch negotiations by both sides and as 'two-way cultural interpreters' we are able to see that both sides are best and optimally served.



# TYPICAL CST LAUNCH CONTRACT

**A TYPICAL CONTRACT (WHETHER PIGGY-BACK OR DEDICATED) DIVIDES THE WORK NATURALLY INTO 4 STAGES:**

- |                |   |
|----------------|---|
| <b>Stage 1</b> | Location of suitable launch options, preliminary price negotiations, report to customer |
| <b>Stage 2</b> | Construction of Launch Services Agreement (LSA)   |
| <b>Stage 3</b> | Management of LSA through ICD, fit check and other meetings                             |
| <b>Stage 4</b> | Management of launch campaign up to integration of payload with launcher                |

- Historically, Stages 1& 2 have saved customer more than CST fees
- Contract can be abandoned after Stage 1 if no suitable launch is found
- Stages are usually sub-divided into several parts



# LAUNCH SOLUTION PROVISION

## GIST Space Ltd

A British registered company formed by CST Ltd (UK) and TSENKI (Russia)

TSENKI is a Federal State Unitary enterprise providing all civil and commercial launches from the launch sites in Russia and Kazakhstan

The formation of GIST was passed by the regulatory/legal departments of the Federal Space Agency (Roscosmos) and the British National Space Centre (BNSC)

Using the combined expertise of the founding companies GIST can supply

- i) Specialist launching solutions not covered by CST's brokerage services
- ii) Dedicated launchers at special prices (such as on tests)
- iii) Sub components such as engines, power systems, satellite busses, etc
- iv) Large scale consultancy and design work not covered by normal CST services

GIST can negotiate the launch of small satellites to GEO by piggy-back.  
Special solutions for larger satellites are also possible and GIST can also arrange launch solutions to special orbits such as HEO, GEO, Escape, etc.



# LAUNCH SOLUTION PROVISION

## Missions to GEO

**GIST Space Ltd is in a position to investigate and broker special launch solutions using all current and projected former Soviet Union (FSU) launchers.**

**GIST Space Ltd is working closely with Space International Services (SIS) and can arrange some particular GEO Launch Solutions. An example is the Zenit 2/Fregat SB vehicle (see below)**

**Several GEO launch solutions are currently under investigation and requests for particular missions are invited.**

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**The Zenit 2/ Fregat-SB** upper stage (SB states for “Jettisonable tank”) launch vehicle is based upon proven technologies and technical solutions and was introduced in 2008. It is composed and has characteristics as follows:

- The Zenit 2 LV is the first two stages (the same as for all Zenit programs; 37 launches fulfilled, launch site will be LC-45 in Baikonur);
- The upper stage Fregat-SB is based upon the proven Fregat design (13 launches, all successful) with an additional jettisonable tank It can provide the customer with 3-axis stabilization or spin-up of their spacecraft;
- The GTO payload capability will be 3.6 tonnes. The vehicle can also deliver payloads direct to GEO, and to escape;
- The payload faring is that which was used many times for the Proton LV.





# LAUNCHING MODES – 1

## 1. PIGGY-BACK

Perceived as the cheapest option. Not always is. Poor partner.

Customer has to go with a main payload and conform to its requirements. Has to be ready on time.

No direct control over orbit or time of launch (control only by selection of best willing partner).

## LEO PIGGY-BACKING IN THE FSU

A variety of vehicles - particularly to LEO

All vehicles can piggy back

Near all orbits available - often visited

But equatorial LEO orbits are difficult

LEO market is settled (GEO market developing)

By careful brokerage using opportunities and experience, very competitive prices still achievable

New launchers will enter the field soon

Multiple payload carriers for small launchers have been developed

CST experience with TSYKLON, ZENIT, COSMOS, DNEPR, SHTIL, etc., as well as its data-base and specialists



## **LAUNCHING MODES – 2**

### **2. SHARED**

With a variety of customers on hand and in negotiation as well as an internal knowledge of ongoing arrangements CST can arrange a fit with other satellites in shared or cluster launches.

If customers, at extra cost, wish to have the chief satellite position in the cluster, thus ensuring their required orbit and time of launch, then CST can help ensure the required number of other satellites to enable the mission to take place.

### **3. DEDICATED**

Using its long association with launch providers and its experience in the field, CST can negotiate the best terms with any launch provider.

Very good terms can be arranged for launches that are designated as tests or promotional. The additional technical risks for the launches can be very low, they will be insurable and CST can advise on this for each specific case.

Using the same skills as employed for arranging shared or cluster launches, CST can negotiate ‘guest’ payloads to enable the defrayment of costs.

New small launchers entering the market, such as Angara-1, Soyuz-1 and Swift which will be able to provide dedicated missions at very economical prices



# WHAT LAUNCH PROVIDERS DON'T TELL

## Potential Delays

- Launch vehicle or main satellite readiness
- Incomplete bureaucracy such as drop-zone arrangement
- Problems with others in manifest
- Customs clearance
- Transport of equipment after launch campaign
- Etc

## Hidden Costs

- Accommodation costs at range
- Transportation to range
- Delayed or repeat launch campaigns
- Facilities for VIPs
- Customs duties
- Etc.

