

A Global Missile Launch Surveillance System for Strategic Stability

Panel Discussion

S.Chandrashekar

Professor Indian Institute of Management Bangalore

J.R.D.Tata Visiting Professor National Institute of Advanced Studies
(NIAS)

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Assumptions

I will adopt the viewpoint of an independent Indian analyst looking objectively at the problem that India faces.

The two major concerns that relate to strategic stability for India are two of India's neighbours – Pakistan and China.

Though the inclusion of China may not qualify as the problems of South Asia, in discussing nuclear stability from an Indian perspective one cannot ignore the role of China.

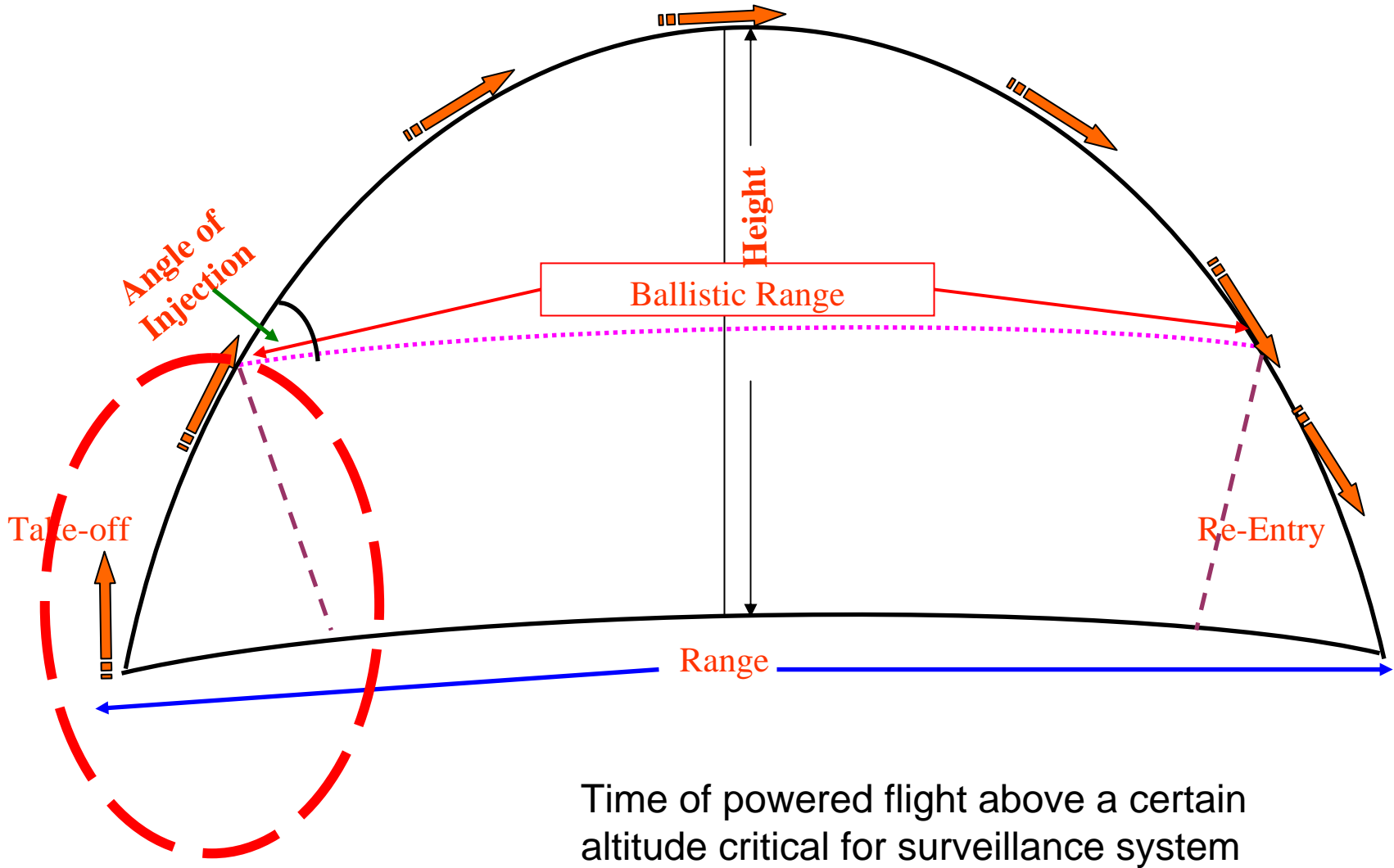
In my presentation today while I will not ignore the reality of Indian Pakistani and Chinese missiles I am going to ignore a number of things.

I will use a magic wand and wish away all the major political problems that one can visualise in setting up an international missile launch surveillance system. We will assume that we have the go ahead and have to look at what kind of a system we should propose.

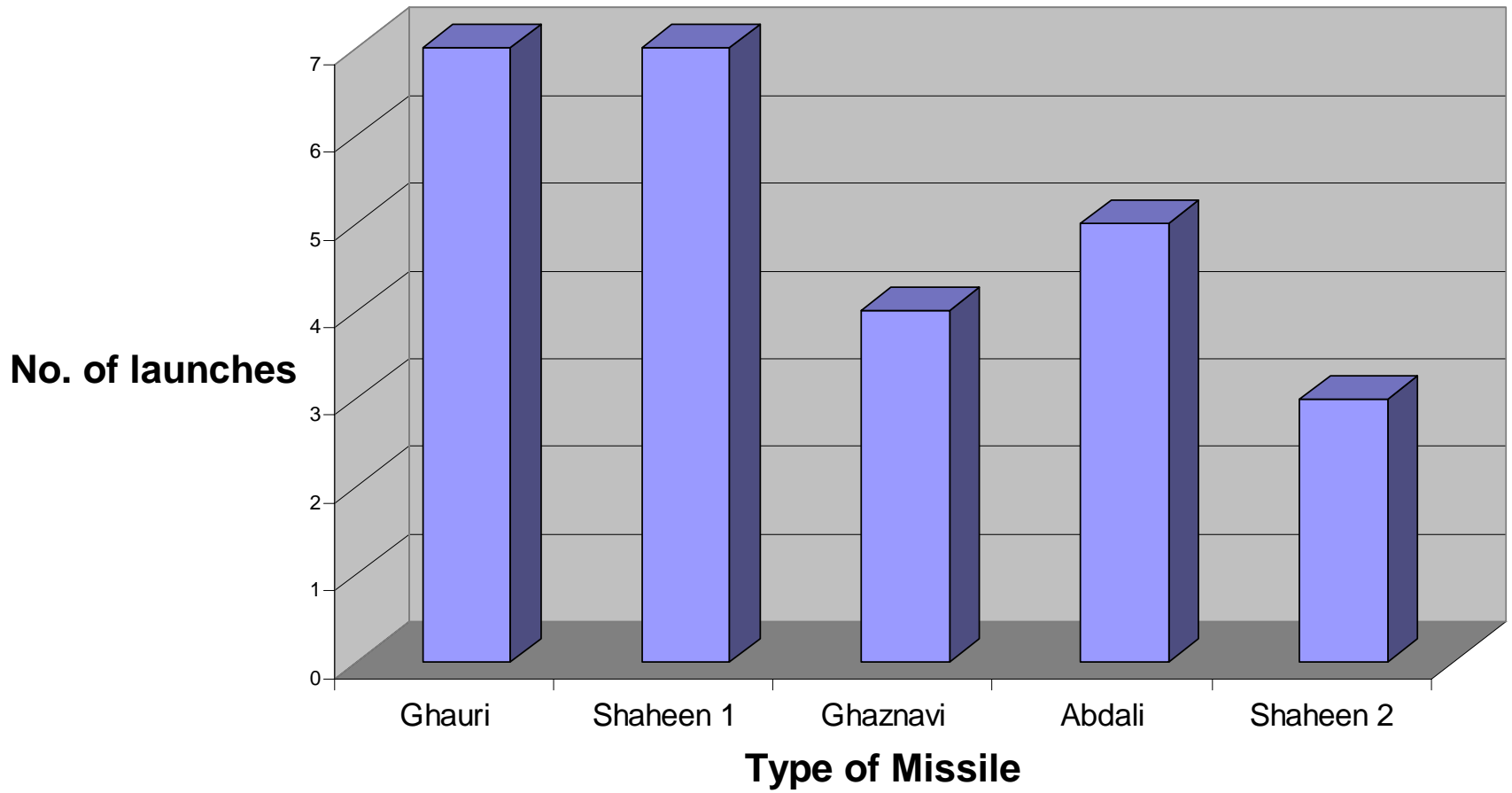
Dr. Forden has already done a lot of work – I am going to only embellish and add a little bit to it largely from an Indian viewpoint. It will be a technical view.

We could of course touch upon the political issues during the discussions

THE TRAJECTORY OF A MISSILE

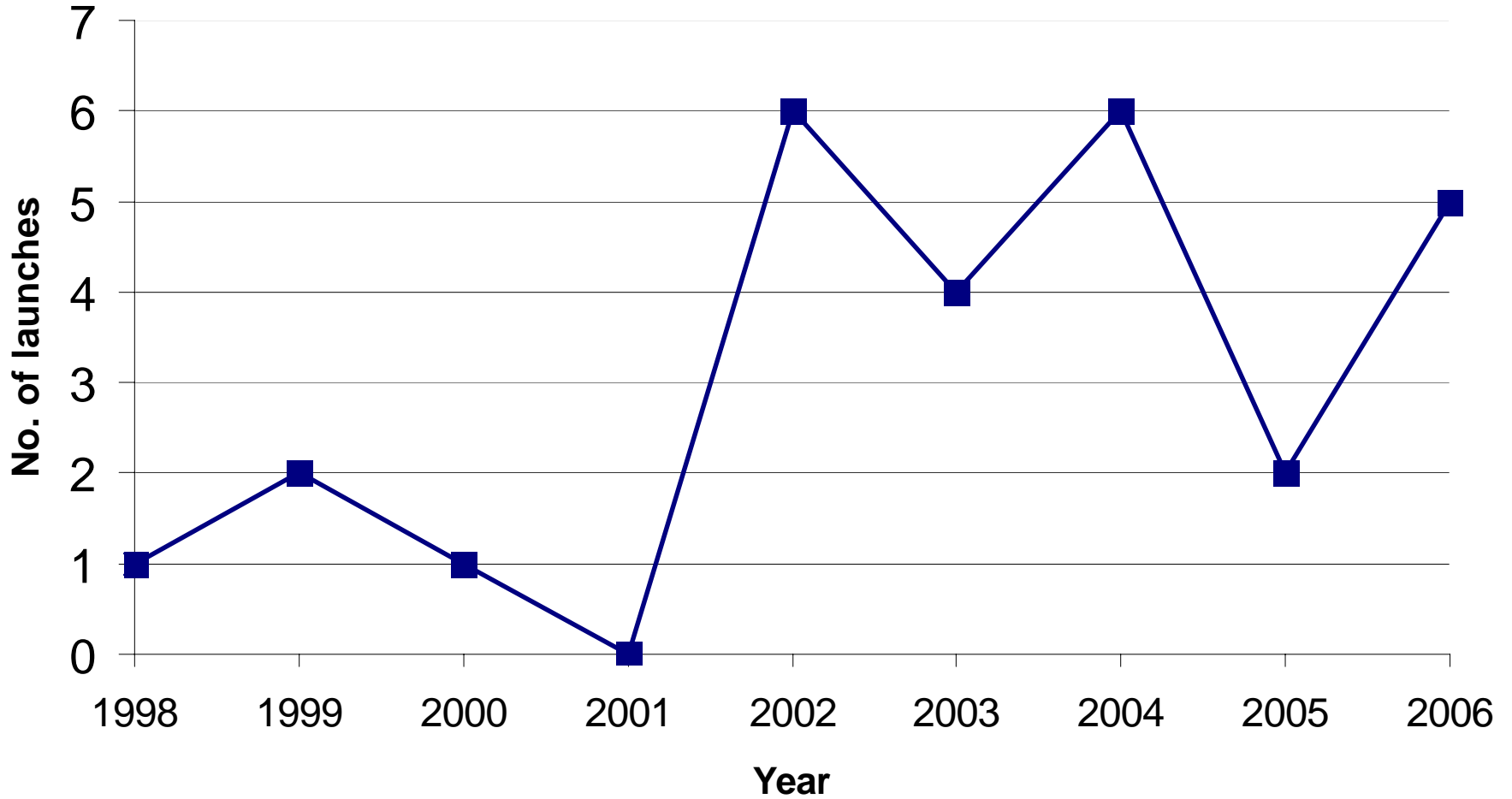


Pakistan missile launch record – by missile type - ~ end 2006

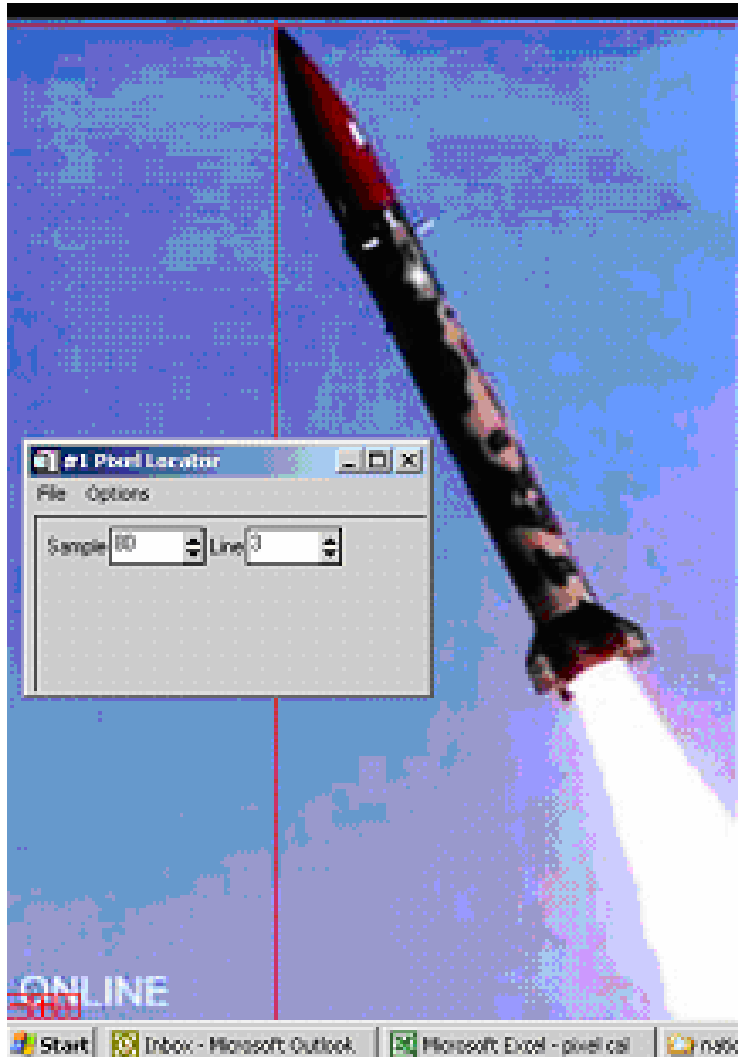


Pakistan Launch History

27 Ballistic missile launches. 4 to 6 per year to be expected



The Abdali Missile



Strategic or tactical ?

Solid propellant

Single stage

85 to 95 km range with a
500 kg payload

The Ghaznavi Missile

Tactical or strategic ?

Bigger missile – solid rocket

Nuclear warhead capable



The Shaheen 1



Very similar in dimensions and performance to the Ghaznavi. There could be issues of separation and discrimination between the Ghaznavi and the Shaheen 1

The Shaheen 2



Two stage
Solid rocket

The Ghauri Missile



Liquid missile

RFNA / UDMH

Single stage

Pakistan Missiles – some relevant parameters

Missile	Time of burnout	Thrust time above 5 km	Burnout altitude
Abdali	42 seconds	16 seconds	13 km
Ghaznavi	37 seconds	18 seconds	19 km
Shaheen 1	53 seconds	30 seconds	27 km
Shaheen 2			
Stage 1	31 seconds	9 seconds	11 km
Stage 2	73 seconds	73 seconds	62 km
Total	104 seconds	> 82 seconds	>62 km
Ghauri	73 seconds	47 seconds	43 km

Implications for design

We can see from this analysis that missile surveillance especially for the very short range Pakistani missiles poses some special problems.

These problems were not important in the US – USSR context since the distance separating the two sides was of the order of thousands of kilometers and the flight times and boost times were correspondingly large

In the case of India and Pakistan we can see that the time of thrusting at altitudes of more than 5 km for some Pakistani missiles is between 16 and 30 seconds. This does not give the sensor enough time to detect and estimate the trajectory unless it is specially designed

To be able to estimate the trajectory reasonably accurately the number of observations should be large. Sampling of the plume at 1 second or 4 second intervals may not be adequate.

A wide field of view that constantly looks at the total earth disc may be necessary. A 3 axis stabilised satellite without a stepper motor that stares all the time at the earth may be needed in case we do not miss the launch.

Since more frequent observations may be needed it may be a good idea to include a second higher resolution instrument especially if you are looking at South Asia

Missile	Time of flight in seconds			Range km			
	Payload kg	500	700	1000	500	700	1000
Abdali		176 sec			95 km		
Ghaznavi			301 sec	267 sec		347 km	269 km
Shaheen 1			375 sec	343 sec		495 km	410 km
Shaheen 2			583 sec	506 sec		1136 km	852 km
Ghauri			528 sec	497 sec		928 km	818 km

Data distribution may have to be in real-time

We can see from the table that the total time available for decision-making ranges from a minimum of 3 minutes for the shorter range missiles to a maximum of about 10 minutes.

This would mean that the data dissemination cannot wait for a suitable time before an independent assessment can be made. Data must be made available in real time

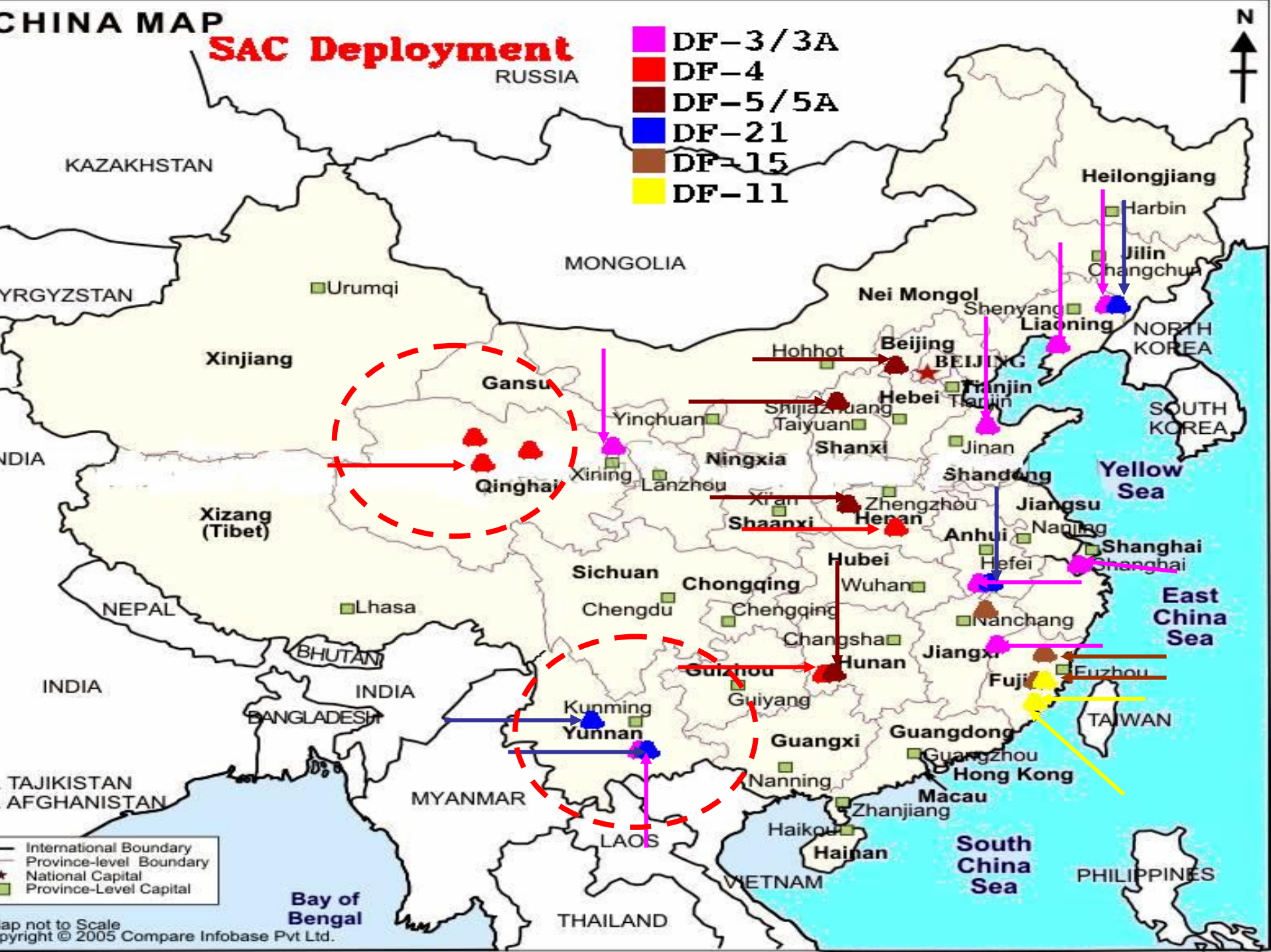
During test launches also the surveillance system can ensure an independent monitoring of the launch so as to make sure that no escalation occurs in case of any problems with the test launches.

Special organisational arrangements may be needed - by the international organisation - political will

CHINA MAP

SAC Deployment

- DF-3/3A
- DF-4
- DF-5/5A
- DF-21
- DF-15
- DF-11

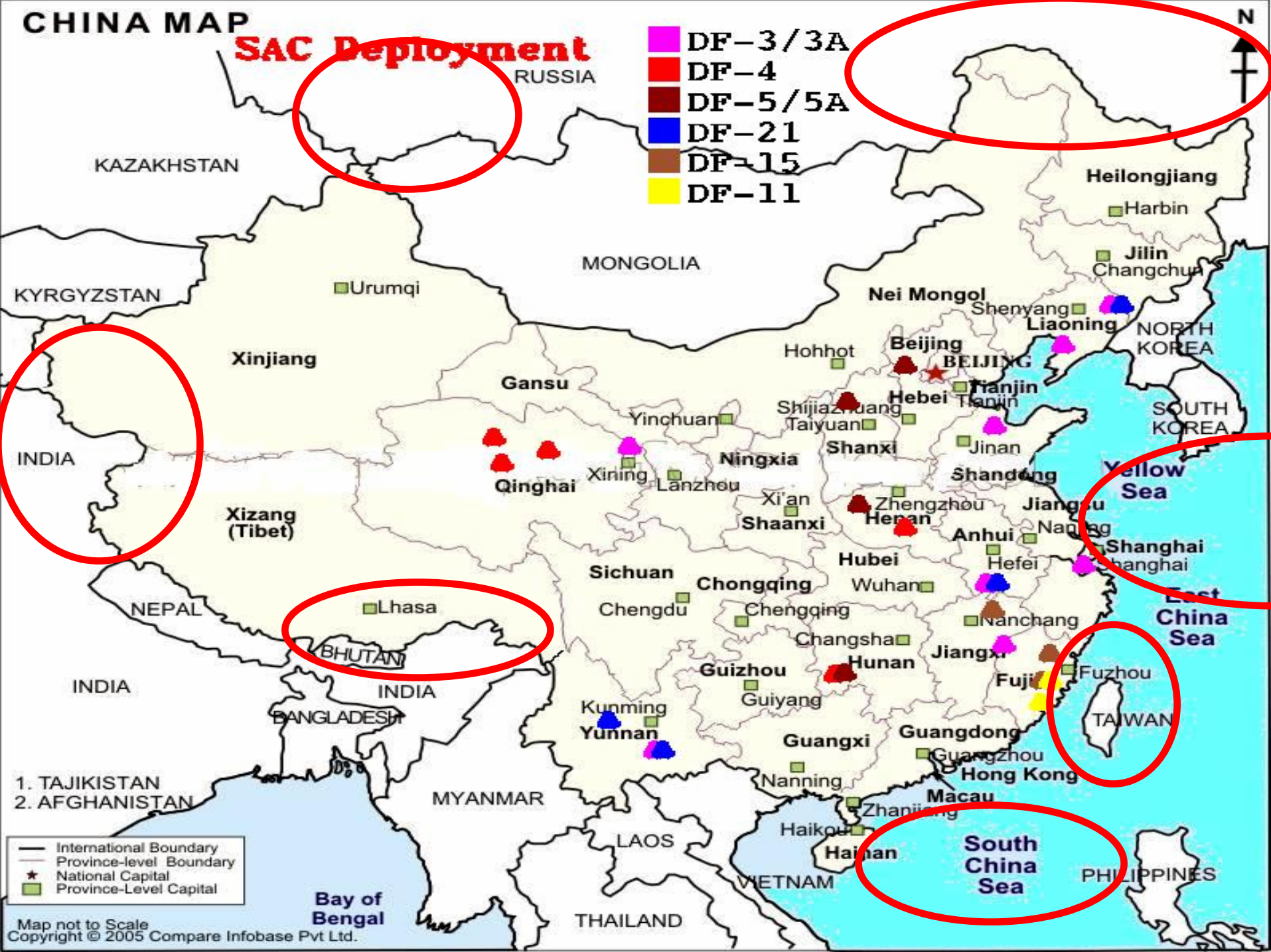


— International Boundary
— Province-level Boundary
★ National Capital
■ Province-Level Capital

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Some Questions

The availability of the Detector arrays with the required performances. Mercuric cadmium telluride detectors operating in the infrared bands – configured as a focal plane array – is one area of critical technology. US and maybe France have capabilities – will they be available. Do not know about Russia, Israel, China.

The field of view or area of coverage should be large – wide field of view optics butting of the detector arrays maybe multiple optical payloads. VHRR experience but design fundamentally different.

The design of the optics could also be critical. One metre – maybe larger - focal length mirrors – special lenses, filters could also be areas of concern. Many remote sensing satellites operate at high resolutions – but they operate largely in the visible and at low orbits. Some stretch of capabilities may be needed.

If the detector requires onboard cooling (most probably it will) this would complicate the design. But again can be done.

International cooperation can also reduce cost. Would France, Russia, China, India and maybe Japan cooperate. Million dollar question.

System may need complementary ground based capabilities. Can such facilities be located across the world at suitable locations to complement satellite surveillance.

Cruise Missiles may be the alternative probable route – no role for space surveillance?