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Risky business? The EU, China and dual-use technology

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**Risky business?
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dual-use technology**

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Summary

This paper argues that it is high time for the European Union to adopt a proactive policy of managing the risks of sensitive technology transfer to the People's Republic of China (PRC). On the basis of a common understanding of the challenges of transferring dual-use technology, economically, politically and security-wise, the European Union can optimise benefits from opportunities available in the promising and technologically rapidly advancing Chinese market.

China's rise as a high-tech military power is central to US security concerns, while a European debate on the implications of a rising China beyond the economic sphere is conspicuous by its absence. Concerns about Intellectual Property Rights (IPR) have prevailed in debates on high technology transfers to the PRC, with less attention being paid to the 'dual use' nature of many of these technologies that can be utilised in both civilian and military applications. Unlike the United States, the European Union has no overview on the amount and generation of sensitive technology exported to the PRC. European policy on dual-use technologies is fragmentary at best, while conflicting export regimes and shrinking investments in research and education throughout the European Union are putting the EU's technological lead at risk. This pressure further increases the need to find outside revenues to fund innovation and the next generation of technology - which could come from the expanding Chinese market. Given the central role of dual-use technologies in today's information-based warfare, the EU's traditionally high level of technology exports to China has become a sensitive topic across the Atlantic in recent years, as was highlighted by the clash over the potential lifting of the EU arms embargo in 2004/2005. In sum, dual-use technology transfers touch on aspects of competitiveness and innovative capacity, market access and security concerns.

A proactive policy needs to be based on a common understanding of China's potential as a military superpower and of its likely impact on the European Union, the EU's policies and its relationship with the United States. A proactive policy needs to merge security, economic and competition aspects in order to sustain and extend the EU's global influence. This influence, especially in the context of the currently intensifying arms race in space, can only be materialised by a political vision, in-depth knowledge of the other parties and a sound base of innovative technology within the European Union. In a post-Cold War world, countries like China represent the greatest opportunities and risks at the same time. The United States has responded to this ambivalent situation by trying

out a system of balancing opportunities against risks in its 'Validated End User' regulation, first introduced in June 2007. The EU needs to follow with a proactive policy of 'managing risks' that helps encourage China to become a 'responsible stakeholder' while enabling European countries to continuously benefit from China's development and at the same time remain vigilant regarding the security-related consequences of China's economic ascent.

This paper therefore recommends that the European Union should (a) work towards a common European strategic assessment of China's ambitions and future global role and the implications for EU policies; (b) strive towards improving the internal coordination of EU external policy-making that integrates commercial *and* military aspects of future technologies and policies; (c) continue engaging with China in high technology cooperation, while maintaining vigilance regarding the risks involved and beefing up its own investments in education and research as outlined in the Lisbon Strategy in order to remain competitive in innovation and high technology.

Introduction

Triggered by China's rise as a high-tech military power and spurred on by US security concerns, the European Union is struggling to transform its primarily economic-based relations with the People's Republic of China (PRC) into a more comprehensive relationship. The 'Sino-Euphoria' that used to underpin the EU's policy of engaging ever more closely with the PRC has in recent years been tempered by a growing uneasiness about trade and competition issues, China's foreign policy goals and the lack of information about the country's military transformation. However, so far European decision-makers have avoided a strategic debate on China's military goals. Concerns about Intellectual Property Rights (IPR) have dominated any debate on high technology transfers to the PRC, although most of this technology is 'dual use' in nature and can be used in both civilian and military applications. No gathered data on the European level exists that could provide a clear picture of the overall volume and quality of dual-use technology delivered to the PRC. With dual-use technologies playing an ever more important role in modern warfare, the EU's traditionally high level of technology exports to China has become an increasingly sensitive topic across the Atlantic in recent years, highlighted by the acrimonious transatlantic debate about lifting the EU arms embargo on China.

Under the new Obama administration, aspects of cooperation with China have been stressed publicly. In substance, however, US China policy has not changed dramatically. The United States continues with a hedging strategy of striving for cooperation while cautiously observing China's military emergence; China is seen as the only country in the world that will be able and might be willing to seriously challenge the United States as a military superpower. Sales of high technology that might ameliorate China's military assets have therefore remained a sensitive topic under the Obama administration. This touches on aspects of competitiveness, market access and security concerns. However, questions arising from the strategic implications of its export policy have given rise neither to a grand debate nor to a coherent European response, owing to the dispersion of competences across EU pillars and Member States, competing industrial policy goals and the absence of a strategic assessment of China's rise. So far, only fragments of a European policy on dual-use technologies exist. At the same time, conflicting export regimes and shrinking investments in research and education throughout the European Union are putting the EU's technological lead at risk.

This paper argues that it is high time for the European Union to adopt a proactive policy of managing the risks of technology transfer in order to

grasp opportunities while developing a common understanding of the implications of dual-use technology transfers to China. A proactive policy needs to be based on a common understanding of China's potential as a military superpower and of its most likely impact on the European Union, on the EU's policies ranging from Galileo to Africa and on the Union's relations with other powers such as the US. Such a policy needs to combine security, economic and competition elements in order to maintain and extend the EU's global influence. If, for example, the European Union wants to effectively influence the currently intensifying arms race in space in a regulated and peaceful direction, it needs to bring something to the table in the ongoing race for technology – a political vision, in-depth knowledge of the other parties and a sound base of innovative technology. Dual-use technology transfer to China is a prime example of the challenges ahead and the European Union needs to respond in a proactive way; a EU policy of 'managing risks' would present the advantages of (i) further assisting China in its transformation process and hence gradually gaining influence over China in a way that encourages the latter to become a responsible stakeholder and partner in the international system, (ii) continuously benefiting from China's development while keeping European countries competitive and (iii) accompanying and hence being able to monitor security-related developments that go hand-in-hand with China's rise.

1. Opportunities, challenges and paradoxes of the EU-China 'strategic partnership'

Six years ago, in 2003, the EU and China proudly announced their 'strategic partnership'. Yet today, after a decade of blossoming relations once dubbed a Sino-European 'love affair'¹ and a 'very serious engagement',² the romance has worn off. Ongoing trade frictions, uneasiness about China's policies in Africa and elsewhere, and heated arguments over human rights during the 2008 Olympic torch relay have put a strain on the relationship. Nevertheless, European officials are determined to 'make the marriage work'.³ To cite Javier Solana, 'the EU perceives China both as an important economic player and also as a catalyst of stability and conflict resolution.'⁴ It is 'among the few strategic partners of the EU in the world.'⁵ The PRC has become a force to be reckoned with in all international affairs concerning the European Union, from climate change to the economic downturn: in the current financial crisis, most hopes are set on China's enormous accumulated financial reserves deriving from the trade surpluses that the PRC runs with major partners. In 2008, the EU's trade deficit with the PRC alone grew by 19 million euro an hour, reaching 169.6 billion euro by the end of the year.⁶ Since China's accession to the World Trade Organisation (WTO) in 2002, EU-China trade has almost quadrupled, making the PRC the EU's second largest trade partner after the United States. Politically, China's influence is burgeoning in East Asia and global affairs alike. It has acquired an increasingly high profile in politics concerning Sudan and Zimbabwe as well as Iran or the North Korea six-party-talks. As one of the permanent five veto-powers (P5) in the UN Security Council, China's contribution to troop-intensive

1. David Murphy and Shada Islam, 'China's Love Affair With Europe', *Far Eastern Economic Review*, 12 February 2004, pp. 26–9.

2. 'If it is not a marriage, it is at least a very serious engagement': Romano Prodi, 'Relations between the EU and China: more than just business', Speech at the EU-China Business Forum, Brussels, 6 May 2004.

3. David Shambaugh, Eberhard Sandschneider and Zhou Hong, 'From honeymoon to marriage: prospects for the China-Europe relationship', in David Shambaugh, Eberhard Sandschneider, and Zhou Hong (eds.) *China-Europe Relations. Perceptions, Politics and Prospects* (New York: Routledge, 2008).

4. Javier Solana meets Wen Jiabao, Council of the European Union, Doc. S022/09, Brussels, 30 January 2009.

5. 'EU seeks solid, comprehensive development of strategic partnership with China, says Solana', Interview, *People's Daily online*, 24 November 2007. Available at: <http://english.people.com.cn/90001/90776/90883/6308790.html>.

6. DG Trade, 'Global Europe. EU-China trade in facts and figures', May 2009. See: http://trade.ec.europa.eu/doclib/docs/2009/january/tradoc_142202.pdf.

international missions is constantly growing.⁷ Like the United States, the EU strives to encourage China to become a ‘responsible stakeholder’⁸ and ‘wants to work alongside China in addressing key international problems, since the two sides are both strong economically, and are both looking to make constructive and meaningful contributions to the stability of our regions and of the wider international community.’⁹

The EU’s perspective on China’s military modernisation

The debate about lifting the EU’s arms embargo on China in 2005 demonstrated the different perceptions of China’s rise within the EU and across the Atlantic. It triggered off acrimonious arguments between EU Member States and the United States. Shortly after the invasion of Iraq, the transatlantic rift had not been healed, there was a high level of distrust and the dispute turned exceedingly bitter. Finally, following US pressure on European business, the embargo was maintained.¹⁰ Somewhat paradoxically, the European Union keeps China in the same category as Zimbabwe, Sudan and Burma/Myanmar by maintaining the arms embargo as it is, while at the same time pushing for a strategic partnership on eye level. Instead of formulating an autonomous EU security perspective on China, the US perspective was partly adopted in ‘East Asia Guidelines’¹¹ for EU policy and an EU-US Strategic Dialogue on Asia was established. The dispute did not trigger off a debate among EU decision-makers and advisers on China’s military development and had no impact on the EU’s policy on transferring sensitive technology to China.

High technology plays a key role in the ongoing Chinese version of a technology-driven ‘revolution in military affairs’ (RMA). After a candid assessment of the poor state of the People’s Liberation Army (PLA), the Chinese leadership seems to have learned the lessons from the United States’ way of conducting the war in Iraq. The PLA is changing from ‘a mass army designed for protracted wars of attrition on its territory to one capable of fighting and winning short-duration, high-intensity conflicts against high-tech adversaries’ based on information warfare – called by the PLA

7. For an overview, see Bates Gill and Chin-hao Huang, ‘China’s expanding peacekeeping role: its significance and the policy implications’, SIPRI Policy Brief, February 2009.

8. Deputy Secretary Robert Zoellick, Statement on Conclusion of the Second U.S.-China Senior Dialogue, Washington DC, 8 December 2005.

9. Javier Solana, ‘EU and China, strategic partners with global objectives’, Interview, *People’s Daily* (China), 17 March 2004; May-Britt Stumbaum, ‘Common Threats – Common Action? Opportunities and Limits of EU-China Security Cooperation’, *The International Spectator*, September 2007, vol. 42, no. 3, pp. 351-70.

10. See May-Britt Stumbaum, *The European Union and China. Decision-Making in EU Foreign and Security Policy towards the People’s Republic of China*, DGAP Schriften zur Internationalen Politik (Baden-Baden: Nomos, 2009).

11. Council of the European Union, ‘Guidelines on the EU’s Foreign and Security Policy in East Asia’, Brussels, PRESS, 14 December 2007. See also Marcin Zaborowski (ed.), ‘Facing China’s rise: guidelines for an EU strategy’, *Chaillot Paper* no. 94, EUISS, Paris, December 2006.

'local wars under conditions of informatization'.¹² Within a decade, China's defence expenditure had octupled to USD 61.5 billion in 2008.¹³ Despite calls for more transparency from the United States and others, the exact nature and use of the expenditures remains difficult to assess.

But the European Union does not seem to respond adequately – there is still a lack of a strategic debate; despite warnings by the Commission, there is little exchange and expertise on China's military transformation among European officials and advisers in Brussels and other European capitals. Increased efforts are being made to follow debates and developments in China, e.g. by seeking personnel for the EU's Situation Centre, but intelligence is still primarily exchanged bilaterally between selected Member States.¹⁴ Notwithstanding these deficits, the central role for dual-use technology in today's warfare sheds critical light on the EU's transfer of sensitive technology to China, particularly after the PRC merged military and civilian research in 2006.¹⁵ In line with the EU's engagement policy with China, Europeans have been the most important source of high technology needed for China's development. EU exports to China of machinery, equipment, transport and electronics aggregate on average to 65 percent of EU exports for the last decade.¹⁶ By voluntary and less voluntary transfers and by Chinese 'reverse engineering',¹⁷ Europeans have been providing technology to China that it cannot obtain from the United States or Japan.¹⁸ European countries are not doing this illegally: export controls are in place across EU Member States; but as export con-

12. The Pentagon, 'Military Power of the People's Republic of China 2007', Annual Report to Congress (Arlington: Office of the Secretary of Defense, 2007), p. 11.

13. However, since vital parts of the budgets of a number of ministries contained military-related expenditure, Western experts assumed that the real amount could well be estimated at somewhere between USD 110 and USD 170 billion for 2005 alone. See: *China Brief*, Jamestown Foundation, vol. 8, no. 6, 14 March 2008; Dan Blumenthal, 'Rising Star: What does China's economy mean for US strategy?', *Armed Forces Journal*, February 2006. Available at: <http://www.afji.com/2006/02/1813778> (accessed: 26 September 2008); Evan Medeiros et.al, 'A New Direction for China's Defense Industry', RAND Corporation, 2005. Available at: http://www.rand.org/pubs/monographs/2005/RAND_MG334.pdf (accessed: 26 September 2008); Information Office of the State Council People's Republic of China, *China's National Defense in 2006*, 29 December 2006.

14. See 'EU-China: Closer Partners, Growing Responsibilities', Communication from the Commission to the Council and the European Parliament, COM(2006) 631 final, Brussels, 24 October 2006.

15. Information Office of the State Council People's Republic of China, 'Medium to Long-term Program on Technological and Scientific Development (2006-2020)', 9 February 2006; 'China to combine military, civilian research organizations', Xinhua New Agency, 9 February 2006. Available at: http://english.gov.cn/2006-02/09/content_183844.htm (accessed 26 September 2008).

16. Jens van Scherpenberg, 'Handels- und Technologiemacht China', in Bates Gill and Gudrun Wacker (eds.) 'Chinas Aufstieg: Rückkehr der Geopolitik?', *SWP-Studie* 2006/S 03, February 2006, p. 18.

17. Less voluntary transfers include forced technology transfer in Joint Ventures, certification practices, and espionage activities. Reverse engineering defines the process of discovering the technological principles of a device, object or system through analysis of its structure, function and operation. Interviews, November/December 2008.

18. See Feng Zhongping, 'A Chinese perspective on China-European relations', in Giovanni Grevi and Álvaro de Vasconcelos (eds.), 'Partnerships for effective multilateralism: EU relations with Brazil, China, India and Russia', *Chaillot Paper* no. 109, EUISS, Paris, May 2008, p. 77; Nicola Casarini, 'The evolution of the EU-China relationship: from constructive engagement to strategic partnership', *Occasional Paper* no. 64, EUISS, Paris, October 2006, p. 29.

trols are still within national competences, regimes are competing and are subject to national interpretations. There is no European overview on the amount and exact nature of dual-use technology that has been delivered to China already. Moreover, the lack of a collective European approach leads to undercutting and incoherence. It happens that non-critical goods such as paint for military applications are banned from being exported as they appear on national munitions lists, and the export of other such minor items is unnecessarily delayed, while whole diesel engines for use in submarines or space technology that can be misused to attack satellites in space can be exported without difficulty.¹⁹ On the other hand, a general tightening of exports due to growing security concerns would backfire on European industries: in the light of insufficient public funding, European companies have been able to supplement investments in research and development by export revenues and cheap imports of less technologically advanced machinery parts. The following section therefore provides an overview of export control regimes, opportunities and the role of the United States in this field.

Export control regimes for arms and dual-use items

Export controls are based on national, European and international regimes and strive to regulate a very diverse challenge: technology to be transferred does not only include high-tech machinery and tools, but goes beyond tangible equipment to also encompass aspects such as knowledge, skills, methods of manufacturing etc. ‘Dual-use’ technology as such is defined as high technology intended for civilian applications, but that is currently or potentially also used for military purposes (*spin-on*) or vice versa (*spin-off*).²⁰ A European common regime faces another challenge as frequently industrial and economic policy considerations influence export control decisions; that is, while security implications are used to justify these decisions, national interests in keeping competitors out of domestic markets and technologies from spreading often play a major role.

‘Dual-use’ and arms exports are regulated by EU Council regulation and by international and national regimes. They are interpreted and executed by national authorities such as the German BAFA export control authority or the British Export Control Organisation (ECO). All civilian goods fall under the auspices of European Community law, but military goods listed in the Annex of Art. 296 of the EC treaty are excluded from Community law for national security reasons. Therefore, individual decisions

19. Interviews, with industry representatives, think tanks and government officials in Berlin, Munich, Paris, London, September-December 2008.

20. See e.g. Jean Pascal Zanders, ‘A Verification and Transparency Concept for Technology Transfers under the BTWC’, Weapons of Mass Destruction Commission (WMDC), no. 26, February 2005, Stockholm: 2005, pp. 24-5.

on whether or not to grant an export licence are taken at a national level. In order to promote a Europe-wide harmonised approach to non-proliferation, the European regimes serve as a framework for reference and reconciling national interpretations. This framework is provided by the legally binding EU Code of Conduct on Arms²¹ and the European Communities' regime for export controls of dual-use items.²² This regime aims to implement all internationally agreed dual-use controls, including the Wassenaar Arrangement, the Missile Technology Control Regime (MTCR), the Nuclear Suppliers Group (NSG), the Australia Group and the Chemical Weapons Convention (CWC). In its tradition of striving to export its norms and regimes, the European Union tries to actively spread its concept of non-proliferation by promoting dialogue with third countries such as China in EU-OUTREACH Pilot Projects.²³

The main weakness of the export control regime lies in the details: firstly, every EU Member State individually translates and implements the politically binding EU Code of Conduct in national law. The same applies to the EU arms embargo on China that has been interpreted quite differently by the EU Member States.²⁴ Differing national interpretations open doors for incoherence and undercutting across the European Union. Secondly, dual-use items are assembled in an inevitably incomplete list in Annex I of the Council Regulation. In order to address this shortcoming, Art. 4 of the regulation – called the 'catchall article' – requires a licence for every dual-use export if the EU has implemented an arms embargo against the recipient country, based on a common position or joint action. The embargo against China, however, pre-dates the introduction of common positions and joint actions by the Maastricht Treaty and is hence only a 'political declaration'. Accordingly, the 'catchall article' misses out on China. Thirdly, due to industrial policy considerations, Member States do not report the volume and type of licences that have actually been granted, but rather report denials of licences. Accordingly there is no overview on the European level of the volume and nature of dual-use technology exported to China and hence no certainty whether a 'critical mass' has been achieved with which China could build e.g. a 'system of systems'. Yet this would be necessary in order to accurately assess the rising military power of China: although still a subject of intense debate, there is an increasing number of Western experts that see Chinese Military Industry (CMI) in many areas as almost on a par with Western technologies.²⁵

21. Council of the European Union, 'Code of Conduct on Arms Export', 8675/2/98 Rev2, Brussels, 5 June 1998.

22. Council Regulation (EC) No 428/2009 of 5 May 2009 setting up a community regime for the control of exports, transfer, brokering and transit of dual-use items (recast), 29 May 2009.

23. Organised by the German BAFA export control authority. See: www.eu-outreach.info.

24. See SIPRI, 'The European Union arms embargo on China' September 2004. Available at: <http://www.sipri.org/contents/expcon/euchiemb.html> (accessed 17 December 2008).

25. Interviews with European and US government officials and experts; see Richard Bitzinger, 'China's Military-Industrial Complex: Is It (Finally) Turning a Corner?', *RSIS Commentaries*, 21 November 2008.

Overall, China vividly illustrates the challenges and opportunities of export controls *vis-à-vis* cooperation in high technology in a post-Cold War order. There is no longer a clear division between ‘trusted countries’ that had good customers for sophisticated high-technology exports and ‘adversary countries’ that were home to companies that were denied those products. Today’s China offers one of the most attractive opportunities for trade, investment and cooperation in the high technology field. Moreover, in the EU’s non-proliferation efforts, China is seen as an important collaborator as shown in China’s participation in the OUTREACH project and the 2004 EU-China Joint Agreement on Non-Proliferation. On the other hand, with China’s record of proliferating weapon technology to its longstanding allies Pakistan and North Korea, it might also hamper non-proliferation efforts from a Western point of view. Despite the notion of the ‘G2’ and an interdependent Sino-US relationship,²⁶ a ‘strategic distrust’ between both powers remains. Current debates in the US under the new administration of President Obama still portray China as an emerging military power whose intentions are not yet clear and as the United States’ most formidable potential competitor. US Secretary of Defense Robert Gates stated in the National Defense Strategy of June 2008 that ‘our strategy seeks to encourage China to make the right strategic choices for its people, while we hedge against other possibilities,’ including the ever more prominent challenge of cybersecurity in times of information warfare.²⁷ These views have not altered significantly under the Obama administration. If the EU follows the US perspective, proliferation of high technology to China also entails high security risks.²⁸ The following section will outline the opportunities and challenges presented by high-tech cooperation with China.

Opportunities and challenges: increasing R&D budgets and a lack of transparency

Risks apart, technology transfers to China offer the chance for better access to an increasingly sophisticated and potent Chinese domestic market, the opportunity to profit from the additional revenue for badly needed investments

26. See e.g. Elizabeth Economy and Adam Segal, ‘The G2 Mirage. Why the United States and China Are Not Ready to Upgrade Ties’, *Foreign Affairs*, vol. 5, no. 86, May/June 2009; Henry C K Liu, ‘Brzezinski’s G-2 grand strategy’, *Asia Times Online*, 22 April 2009: available at: http://www.atimes.com/atimes/china_business/kd22cb03.html (accessed 3 September 2009).

27. Department of Defense, *National Defense Strategy of the United States of America*, June 2008; Speech on Cyber Security at the Center for Strategic and International Studies, delivered by Deputy Secretary of Defense William J. Lynn, Center for Strategic and International Studies, Washington, D.C., Monday, 15 June 2009.

28. US Under Secretary of Industry and Security, Mario Mancuso, in ‘Securing our Exports to China: New Rules Can Limit Military’s Access to High Technology’, *San Jose Mercury News*, 18 June 2007, p. 1. Under the new Obama administration, recent attempts by the US Secretary of Defense Robert Gates to cut back expenditure on the F22 Raptor fighter plane were countered by references to the Chinese challenge; see e.g. Richard Fisher, ‘China Puts Up a Fighter: Beijing’s fifth-generation military challenge to the U.S.’, *The Wall Street Journal*, 1 September 2009.

in research and development (R&D) and might even offer opportunities to benefit from China's enormous investments in its own R&D sector.²⁹

Opportunities are offered by China's enormous investments in buying and developing new technologies. Besides efforts to acquire mature technology from outside as demonstrated again by recent Chinese shopping delegation trips known as 'bridge of confidence tours' to the EU, the People's Republic is heavily investing in indigenous research and development (R&D). The EU will most probably not meet its Lisbon agenda goal to create a European Research Area (ERA) and increase R&D spending to 3 percent of GDP by the year 2010. In fact, R&D investments are stagnating throughout the EU, and this was the case even before the financial crisis hit national budgets.³⁰ R&D investments in China, however, have been growing since 1997 by approximately 10 percent per year to a total of 300 billion yuan (29.2 billion euro) in 2006. According to the OECD, while China was still on par with Germany in 2001, it spent twice as much as the Federal Republic in 2006 and is expected to spend as much on R&D by the year 2010 as the European Union as a whole. For that same year, Chinese R&D investments are expected to account for 2.2 percent of the Chinese GDP.³¹ The economic impact of the slump in exports in the wake of the global financial crisis on coming investments cannot be assessed yet. But China has already become the second biggest investor in innovation just after the United States of America.³² The high amount of currency reserves held by China and the government's current policy of stimulating indigenous consumption and production should tend to solidify those investments. The main destinations for those investments are laid out in the 'Medium to Long-term Program on Technological and Scientific Development (2006–2020)' where the State Council identified 11 priority sectors for technological development. These priority sectors include technologies with dual-use relevance such as information and telecommunications technology, space technology and national defence.

The expenditure of the 26 EDA-participating Member States (pMS)³³ is also rather stagnant in the area of defence; all pMS combined spent a total of 9.7 billion euro on R&D in 2006 and a total of 201 billion euro on

29. See Bram Akkermans, *The Principle of Numerus Clausus in European Property Law* (Antwerp/Oxford/Portland: Intersentia, 2008).

30. Council of the European Communities, 'The Lisbon Strategy and the new dynamics for science, technology and innovation'. Available at: ftp://ftp.cordis.europa.eu/pub/indicators/docs/3rd_report_snaps0.pdf (accessed 26 September 2008).

31. The impact of the financial crisis still needs to be gauged. For forecast scenarios, see: *OECD Science, Technology and Industry Outlook 2006*, OECD, Paris, 4 December 2006; Ministry of Science and Technology, *2007 China Science & Technology Statistics Data Book*, PR China, 2007.

32. *OECD Science, Technology and Industry Outlook 2006*, op. cit. in note 31.

33. All EU Member States except Denmark participate in the EDA.

defence expenditure (1.78 percent of GDP).³⁴ China on the other hand, as envisaged in China's Science & Technology Strategy of 2006,³⁵ has merged civilian and military research. Its R&D investments are estimated at around 14 billion euro in 2006 (a quarter of the US's R&D spending) with an average increase in defence spending of 15.4 percent annually for the past 15 years.

In China's 2006 White Paper on Defence, the Chinese government makes an explicit link between developing cutting-edge military-related technology and promoting overall economic development. (The US, for its part, no longer makes the link as explicit as the Chinese do in their paper.) The paper states that 'priority is given to R&D [...] to achieve breakthroughs in a number of key technologies and leapfrogging technological progress. [...] Priority is given to upgrading technologies and products in the nuclear, space, aviation, shipbuilding, weaponry, electronics and other defence-related industries, so as to form a cluster of high-tech industries to drive the growth of China's economy.'³⁶ The 11 priority sectors outlined in China's 'Medium to Long-term Program' coincide to a great extent with the seminal technologies named in the Seventh Framework Programme for research and technological development (FP7)³⁷ that serves as an instrument for the Lisbon objectives.

Challenges arise from non-voluntary technology transfer and reverse engineering, but the main challenge is the lack of European in-depth thinking on the future role of China as an emerging great power. By collaborating on cutting-edge dual-use technology, will European companies, engineers and researchers build up a non-tameable adversary or facilitate China taking on more international responsibility? Despite China's emphasis on 'peaceful development' and increasing participation in international missions, the non-transparency and rapid increases in defence spending and incidents like the anti-satellite (ASAT) test in January 2007³⁸ leave Europeans along with Americans uncertain about China's long-term interests. The resulting uneasiness and lack of trust is spurred by the difference in

34. Figures are taken from the EDA website (www.eda.europa.eu); R&D refers here to any R&D programmes up to the point where expenditure for production of equipment starts to be incurred. On R&T (Research and Technology, defined as a subset of R&D, that is expenditure for basic research, applied research and technology demonstration for defence purposes), the EDA participating Member States spent €2.6 billion in the same year.

35. Information Office of the State Council, People's Republic of China, 'Medium to Long-term Program on Technological and Scientific Development (2006-2020)', 9 February 2006; 'China to combine military, civilian research organizations', Xinhua News Agency, 9 February 2006. Available at: http://english.gov.cn/2006-02/09/content_183844.htm (accessed 26 September 2008).

36. Information Office of the State Council, People's Republic of China, 'China's National Defense in 2006', 29 December 2006, chapter VIII.

37. For more information, see: <http://cordis.europa.eu/fp7/>.

38. See e.g. Philip C. Saunders and Charles D. Lutes, 'China's ASAT Test: Motivations and Implications', INSS Special Report, June 2007.

the political and social systems of both emerging global actors and the 'strategic distrust'³⁹ between China and the EU's most important ally, the United States – which still exists under the new Obama administration. Moreover, diverging attitudes do matter in the details of EU-China cooperation: conditioned by the EU's system of separated competences, European officials emphasise the civilian dimension of new technologies such as space (e.g. Galileo) and only recently included military aspects officially.⁴⁰ The Chinese side emphasises the primacy of a peaceful exploration of space, yet puts the role of space technology for national security first.⁴¹ Where Galileo is under civilian control in the Commission, the ultimate control of all space activities lies with the military-staffed General Armaments Department (GAD) of the PLA.⁴² Initiatives like the merger of military and civilian research on the Chinese side (as has been done in the US) further illustrates the new environment for international cooperation in which the EU finds itself: civilian and military uses can no longer be easily distinguished, separated and controlled.

Weighing up opportunities against risks, the advantage of collaboration scores higher: collaborating with China offers new revenues that can be used for R&D in seminal technologies, participation in a burgeoning market and the possibility of keeping track of China's developments. Moreover, collaboration can further encourage China to step up its participation and compliance in non-proliferation regimes that will not succeed without China's engagement. Dual-use technologies will be a test case of whether the European Union will be able to adapt and gain from new realities. China will continue to push for progress in this area and will, given the financial resources and the fact that China's future manpower is being trained at both Chinese and Western universities, catch up ever more rapidly. In a post-Cold War world where China represents a strategic partner as well as a challenge, it will be up to the EU to find a proactive policy of 'managing the risks'⁴³ in order to benefit rather than to suffer from this emerging competitor.

39. William S. Cohen, Maurice Greenberg and Carola McGiffert, 'Smart Power in US-China Relations. A Report of the CSIS Commission on China', Center for Strategic and International Studies (CSIS), Washington D.C., March 2009.

40. 'Europe gets space policy after Galileo setback', *Euractiv*, 21 June 2007. Available at: <http://www.euractiv.com/en/science/europe-gets-space-policy-galileo-setback/article-163909> (accessed 23 September 2008); Council of the European Union, European Space Policy: 'ESDP and Space', 11616/3/04 REV 3, Public, Brussels, 16 November 2004; European Parliament, Karl von Wogau, *Report on Space and Security* (2008/2030(INI)), A6-0250/2008, 10 June 2008.

41. Information Office of the State Council of the People's Republic of China, 'China's Space Activities in 2006', Beijing, October 2006, p. 2.

42. Final oversight lies with GAD: while Galileo is located at the Ministry of Science and Technology (MOST), the indigenous COMPASS system comes under the remit of the PLA. Interview, 19 September 2008; Nuclear Threat Initiative (NTI), 'General Armaments Department (GAD)', 2003. See: <http://www.nti.org/db/china/gad.htm> (accessed 29 June 2009).

43. See here also the policy recommendations of the European Chamber of Commerce in China in its 2008/2009 *European Business in China* Position Paper, September 2008. See: <http://www.eurochamber.com.cn/view/media/fullview?cid=2705>.

The ‘elephant in the room’ – the role and approach of the United States

The framework of EU policy towards China in this sensitive area cannot be discussed without taking into account ‘the elephant in the room’ when it comes to shaping European foreign policy: the United States of America. As Henry Kissinger once pointed out, the United States’ support for a more political union exerting a distinctively European foreign policy has always been ambivalent, but its influence has been decisive.⁴⁴ The following section will therefore sketch out the response of the United States to China’s rise and its influence on EU-China policy.

The US government’s attitude towards China has shifted in recent years from policies of containing the ‘strategic competitor’ to alternately hedging and engaging the aspiring ‘responsible stakeholder’.⁴⁵ China has provided support for the United States’ ‘Global War on Terror’ (GWOT). But a much more important factor might be the fact that China has been financing the US budget deficit and, as the biggest foreign holder of US currency reserves, holds almost USD 730 billion in US treasury bonds. In turn, the US is running a merchandise trade deficit of nearly USD 2 billion per day.⁴⁶ The former Bush administration acknowledged China’s rise as a ‘signature development for US economic and national security policy. For US policy on high-tech exports, China represents the starkest example of the end of the Cold War’⁴⁷ – and therefore an end to the era characterised by clear division between allies and adversaries regarding export policies. For the former US Undersecretary of Industry and Security, Mario Mancuso, China today offers attractive trade opportunities and security risks at the same time, like ‘virtually all of America’s trading partners’.⁴⁸

44. Quoted in Ian McLean and Alastair McMillan, *Oxford Concise Dictionary of Politics* (Oxford: Oxford University Press, 2003), p. 349. See also May-Britt Stumbaum, op. cit. in note 10, chapter 3; David C. Gompert, François Godement, Evan S. Medeiros and James C. Mulvenon, ‘China on the Move. A Franco-American Analysis of Emerging Chinese Strategic Policies and Their Consequences for Transatlantic Relations’, RAND-IFRI Conference Proceedings, June 2005 (Arlington: RAND, 2005).

45. See Marcin Zaborowski, ‘China policy: no revolution’, in Marcin Zaborowski (ed.) ‘Bush’s legacy and America’s next foreign policy’, *Chaillot Paper* no. 111, EUISS, Paris, September 2008; Wang Xianyan and Sun Yan, ‘Tentative Analysis of the Adjustment of US China Policy’, International Strategic Studies, China Institute for International Strategic Studies, March 2006; Yuan Peng, ‘China Policy under the Next Bush Administration’, *China Brief*, vol. 4, no. 22, The Jamestown Foundation, 11 November 2004; Tony Karon, ‘Bush China Policy Defaults to Engagement’, *Time Magazine*, 31 July 2001; John J. Tkacik, ‘Hedging Against China’, *Backgrounder* no. 1925, The Heritage Foundation, Washington D.C., 17 April 2005; Evan S. Medeiros, ‘Strategic Hedging and the Future of Asia-Pacific Stability’, *The Washington Quarterly*, vol. 29, no. 1, 2005, pp. 145-67; C. Fred Bergsten, Bates Gill, Nicholas R. Lardy and Derek J. Mitchell, *China – The Balance Sheet: What the World Needs to Know Now About the Emerging Superpower* (Washington DC: Public Affairs, 2006).

46. Wendell Minnick, ‘US Eases Restrictions on Dual-Use Exports to China’, *Defense News*, 19 January 2009.

47. ‘Enhancing Secure Trade with China’, Remarks by Mario Mancuso, Under Secretary of Industry and Security, Bureau of Industry and Security, US Department of Commerce, US-China Business Council, 18 June 2007. Available at: <http://www.bis.doc.gov/news/2007/mancuso06182007.htm> (accessed 25 September 2008).

48. Mario Mancuso, ‘Securing our Exports to China: New Rules Can Limit Military’s Access to High Technology’, *San Jose Mercury News*, 18 June 2007.

In a new policy approach, the US Department of Commerce tried to limit trade obstacles in the domain of high technology while extraterritorially applying US export control laws. The result was a significant change in US dual-use licensing policy in June 2007: by labelling selected Chinese companies as Validated End User (VEU), the new regulation aimed at facilitating the transfer of certain types of sensitive technology while introducing more screening tools such as on-site inspections in Chinese factories. Experiences have been mixed and although the Chinese side did not agree to the on-site inspections initially, the outgoing administration announced the full implementation of the Validated End-User (VEU) programme for China on 19 January 2009.⁴⁹

Regarding the EU-China relationship, the United States continues to view Sino-European cooperation in the high technology field with some suspicion: China has always been seen by US decision-makers first and foremost as a strategic issue; the acrimonious debate about lifting the arms embargo made it clear however that this perspective was not shared unanimously by all Europeans. There is still mistrust regarding the 'true intentions' of individual EU Member States when dealing with China and a lack of faith in the effectiveness of European control mechanisms.⁵⁰ Moreover, US companies complain that different regulations in the US and European countries have a negative impact on their competitiveness in the Chinese market.⁵¹ Accordingly, the United States is extremely concerned about large-scale transfers of dual-use technologies such as command, control and reconnaissance to China that would enable the PRC to greatly enhance already existing weapon platforms by building 'systems of systems'.⁵² In 2005, Chinese academic journals underlined China's primary interest in acquiring 'some of the world's best technological products' from Britain, France and Germany in order to overcome the weaknesses of China's conventional weaponry.⁵³ With the crucial role played by GPS and information in the US military doctrine of network-centric warfare, the United States has been particularly worried about the transfer of space technology. Albeit without success, the Bush administration expressed its concerns about the Sino-European cooperation agreement

49. Interviews with US-American officials and European Commission officials, 29 and 30 September 2008, December 2008; for a critical account, see: Wisconsin Project on Nuclear Arms Control, 'In China We Trust? Lowering US Controls on Militarily Useful Exports to China', January 2008.

50. See e.g., United States House of Representatives, 'Urging the European Union to Maintain Its Arms Embargo on China', Resolution H.RES 57, 109th Congress, 2 February 2005.

51. Interviews with the US Bureau of Industry and Security, Department of Commerce, the Government Accountability Office (GAO), staff members of Congress and representatives from US companies, April and July 2009.

52. Former CIA Director James Woolsey as quoted in *Aviation Week & Space Technology*, 7 March 2005; Kristen Archick, Richard A. Grimmett and Shirley Kan, 'European Union's Arms Embargo on China: Implications and Options for US Policy', CRS Report for Congress, Washington D.C., updated 27 May 2005.

53. Yu Yang, 'What Weapons Will China Be able to Purchase from Europe?', *Kuang Chiao Ching* ['Wide Angle'], 16 May 2004.

on Galileo which was signed in 2003,⁵⁴ but also about European sales of dual-use satellite technology and the development of ITAR-free satellites to be delivered to China.⁵⁵ At the end of the day, there is also a competition element that adds tension to transatlantic quarrels over China: the United States and the EU Member States, two high-tech players with high labour costs, are competing for the same market with similar goods; both parties are tempted to reduce their respective trade deficits with China by selling high technology goods to China. As *The Economist* stated in August of last year, ‘the zealous application of the export rules is the American space industry’s biggest handicap.’⁵⁶ On the US side, there is little sympathy for the European Union deriving benefit from pursuing a diverging policy.

The differences in EU/US perceptions of China, competing interests and a lack of communication between the EU and the US bear the potential for putting increased strain on the transatlantic relationship. Given the differing views regarding China’s threat potential versus its attractive market potential, the possibility of further transatlantic conflict under the new Obama administration cannot be ruled out. So far, European companies have to reactively adopt US export regulations for their global business if they want to continue doing business in the US market. The European Union needs to proactively develop a European policy on dual-use exports that can deal with US concerns on eye level while establishing and pushing for defined comparable or even common standards and practices. First and foremost, it is important to consider from a European point of view the limits of dual-use technology transfer as well as the opportunities presented by dual-use technology transfers. The following section aims to address these issues by focusing on two case studies in the field of aerospace and aviation.

54. See e.g. Bastian Giegerich, ‘Navigating differences: transatlantic negotiations over Galileo’, *Cambridge Review of International Affairs*, vol. 20, no. 3, 2007, pp. 491–508.

55. Any US export of commercial satellites is subject to the International Traffic in Arms Regulations (ITAR) and governed by the US State Department’s Munitions List. This effectively closed the Chinese market to all Western launches until a Chinese Long March rocket launched an APSTAR VI communications satellite, based on the Thales Alenia Space (then Alcatel Alenia Space) Spacebus 4000 platform that had intentionally been developed without any US components as an ITAR-free satellite. See Christopher Griffin and Joseph E. Lin, ‘China’s space ambitions’, *Armed Forces Journal*, April 2008. Available at: <http://www.afj.com/2008/04/3406827> (accessed: 7 October 2008); interviews, November 2008.

56. ‘Earthbound: Gravity is not the main obstacle for America’s space business. Government is’, *The Economist*, 21 August 2008. See: http://www.economist.com/displaystory.cfm?story_id=11965352&fsrc=rss (accessed: 29 June 2009).

2. Two case studies on challenges and opportunities in the Aerospace Sector

In theory, there are two possible approaches towards China as a rising high-tech power: cooperation and containment. Cooperation clearly entails the risk of losing intellectual property and technological headway and causing additional costs due to coordination;⁵⁷ on the positive side, conversely, cooperation gives access to more ideas, more financial means, more brains and facilitates the entering of markets abroad. This would add to the *per se* attractiveness of investments in dual-use technology; the dual applicability of technology generally mitigates the risks of high investments in technology for the heavily restricted, small market of military procurement.⁵⁸ Containment of technology, on the other hand, will be very difficult to execute in times of global flows of goods and production, Chinese students being trained at Western universities, reverse engineering, espionage and so forth.⁵⁹ Moreover, such a policy could turn out to be even counter-productive. Given the complex web of trading and business links and accelerated diffusion of technology through modern information and communications systems, Jens van Scherpenberg argues that ‘even if it were possible to hold back China’s intellectual potential and maintain an American and European technical advantage for a time, the loss of global economic wealth caused by such a containment policy would be considerable.’⁶⁰

The aerospace sector qualifies in several aspects as the focus for a case study on dual-use technology transfers from the European Union to China: firstly, the aerospace sector is one of the most ‘Europeanised’ sectors in European industries and provides a good indication of the future orientation of European policy. Moreover, the sector is characterised by enormous costs for R&D, substantial potential savings and revenues and a high degree of politicisation. And finally, in times of network-centric

57. See Jean Pierre Darnis, Giovanni Gasparini, Christoph Grams, Daniel Keohane, Fabio Liberti, Jean-Pierre Maulny and May-Britt Stumbaum, ‘Lessons learned from European defence equipment programmes’, *Occasional Paper* no. 69, EUISS, Paris, October 2007.

58. See, for example, Joan Johnson-Freese, ‘China’s Space Ambitions’, *Proliferation Papers*, no.18, Institut français des relations internationales (Ifri), Paris, Summer 2007, p. 8; D. Davies, ‘Defence research: dual use or dual use technology?’, *Engineering Management Journal*, vol. 4, no. 5, October 1994, pp. 231–42.

59. Not to forget other emerging space nations such as India; see ‘India’s moon mission enters lunar space’, 4 November 2008, available at: <http://www.physorg.com/news144993415.html> (accessed: 12 November 2008); ‘India launches first Moon mission’, BBC News Online, 22 October 2008, available at: <http://news.bbc.co.uk/1/hi/sci/tech/7679818.stm> (accessed: 12 November 2008); Jeff Foust, ‘The other rising Asian space power’, *The Space Review*, 18 December 2006, available at: <http://www.thespacereview.com/article/768/1> (accessed: 12 November 2008).

60. See Jens van Scherpenberg, *op. cit.* in note 16, pp. 18-19.

warfare and RMA, dual-use technology in the aerospace sector has gained a central role; considering that military implications of any transfer in this area are inevitable and can serve as a nucleus for a strategic debate on this issue.⁶¹

Case study I: Cooperation in space – the case of Galileo

Cooperation with China on the EU's space endeavour Galileo⁶² was triggered both by political and commercial considerations: EU decision-makers wanted to bolster the nascent EU-China strategic partnership; there was a need to build up international support, primarily *vis-à-vis* American and internal EU resistance;⁶³ and finally, there was the attractive prospect of gaining access to the vast Chinese market, as Galileo was meant to be financed by selling commercial applications.

In the heyday of EU-China relations in 2003, China became a partner in Galileo for a financial contribution of 200 million euro including a 15 percent share in the then central body for project management and oversight, the Galileo Joint Undertaking (GJU). The focus was notably on science and technology, industrial manufacturing, service and market development, as well as standardisation, frequency and certification.⁶⁴ Participation in GJU provided the Chinese side with access to information on all projects that were going on within the Galileo framework.

From an economic point of view, cooperation with China fits in well with the desire to make Galileo a profitable global system: international cooperation has been promoted as a means to 'reinforce industrial know-how and to minimise the technological and political risks involved.'⁶⁵ Assuming its interoperability with other systems such as the US GPS, Galileo's 32 satellites would strengthen the overall availability of navigation signals on earth. This for instance would help to overcome the persisting gaps in navigation signals, e.g. between steep mountains or skyscrapers. This in turn makes Galileo's commercial services more accurate and hence more attractive. Cooperation with China serves in this respect as a door-opener

61. See for an in-depth discussion of these sectors, Ian Anthony, 'Militarily relevant EU-China trade and technology transfers: Issues and Problems', Paper presented at the conference on Chinese Military Modernization, CSIS, 19-20 May 2005.

62. See Gustav Lindstrom with Giovanni Gasparini, 'The Galileo satellite system and its security implications', *Occasional Paper* no. 44, EUISS, Paris, April 2003.

63. Interviews with EU officials, Brussels, 30 October 2008; see also Giegerich, op. cit. in note 54.

64. 'Galileo: Loyola de Palacio welcomes the green light for an EU-China agreement', IP/03/1461, Brussels, 27 October 2003; 'Cooperation Agreement on a Civil Global Navigation Satellite System (GNSS) - GALILEO between the European Community and its Member States and the People's Republic of China', Beijing, 30 October 2003.

65. See the European Commission's website at: http://ec.europa.eu/dgs/energy_transport/galileo/international/cooperation_en.htm.

and marketing tool for Galileo's services, ranging from the signals that mostly interest government agencies (e.g. the search & rescue, safety-of-life signals) to private sector signals (e.g. navigation in traffic). Additional revenues are expected from the sales of instruments, ranging from receivers as well as of – to a lesser extent – more specialised instruments designed to use the services of Galileo.

From a strategic point of view, collaboration with China can present even more advantages; it created the momentum to get Galileo off the ground in the first place. It can help to gain a better insight into China's development and intentions and hence more of an overview of the technology already being siphoned off to China. Finally, it can support those forces within China that work for the closer integration of China into international institutions. The European Space Council emphasised in its 2008 guidelines the importance of Europe's 'sovereignty' in space; it defined space as a Lisbon 'growth sector' for the EU and a means to improve security.⁶⁶ The integration of China in Galileo in 2003 helped to overcome resistance from individual EU Member States and the United States against an independent EU system, a crucial step towards this 'sovereignty in space'. Collaboration also falls in line with the EU policy of tying China closer to the international system; dialogue and collaboration will help to avoid dangerous misinterpretations of the PRC's intentions in space and hopefully lead to more transparency.⁶⁷ Snubbing a China that is showing signs of opening up by rejecting cooperation, on the contrary, will tend to lend support to nationalistic hardliners in the People's Republic and fuel indigenous development which will remain intransparent to the outside world.

The main challenge to cooperation derives from the intrinsically strategic nature of space technology which comes down to two aspects: resources and asymmetry. Developing space technology requires the allocation of massive resources; those that own the assets will lead in technology. This technological lead provides selected receivers with an asymmetrical advantage in times of network-centric operations: they enjoy preferential access to information while it is denied to others.⁶⁸ In contrast to the EU

66. See Council of the European Union, Council Resolution, 'Taking forward the European Space Policy', 2891st Competitiveness (Internal Market, Industry and Research) Council meeting, Brussels, 26 September 2008; Vidal Ashkenzai, 'The challenges facing Galileo', in *Space Policy* no. 16, 2000, pp. 185-88; Paul B. Larsen, 'Issues relating to civilian and military dual uses of GNSS', in *Space Policy* no. 17, 2001, pp. 111-19

67. Interviews with Chinese PLA officers and European diplomats at national embassies, Beijing, January 2007, June 2008; Joan Johnson-Freese, 'Strategic Communication with China: What message about space?.' *China Security*. vol. 1, no. 2, World Security Institute, 2006, pp. 37-57; Gregory Kulacki, 'Lost in Translation', *Bulletin of the Atomic Scientists*, May-June 2006; Gregory Kulacki and David Wright, 'New Questions About U.S. Intelligence on China', available at: http://www.ucsusa.org/global_security/china/new-questions-about-us-intelligence-on-china.html; Gregory Kulacki and David Wright, 'A Military Intelligence Failure: The Case of the Parasite Satellite', available at: http://www.ucsusa.org/global_security/china/a-military-intelligence-failure-the-chinese-parasite-satellite.html.

68. Giovanni Gasparini from the Istituto Affari Internazionali (IAI) in Rome explained this aspect in great detail at a Brussels workshop on Space and ESDP, 11 October 2008.

approach of framing Galileo as a commercial undertaking, space technology has traditionally been motivated by military needs. The return for the enormous investments is perceived in terms of national security and national prestige, with the civilian use representing a beneficial 'spin-off' or by-product.

The European Union however, due to the ongoing struggle between Brussels and the capitals over competences in security policy, faces difficulties in acknowledging the dual-use character of space technology. This in turn puts it in an uncomfortable, weakened position in negotiations with China and the United States. Moreover, in an effort to appease all Member States, the highly politicised wishlist for Galileo has made it almost impossible for Galileo to succeed. As one of the flagships of the European Space Policy,⁶⁹ Galileo has to be the best and biggest system;⁷⁰ compatible and interoperable with all existing systems of the US, Russia and China; a commercial success that provides strategic independence – while being essentially underfunded.⁷¹ Ongoing political manoeuvring of EU Member States and the Commission due to this struggle over competences in this dual-use project have been hampering a clear definition of the aim, scope and nature of the project; When civilian officials from the European Commission tried to understand the perspectives of US military officers and vice versa in the negotiations on compatibility, interoperability and solving frequency overlays, it led to distrust and misunderstandings between the EU and its partners China and the United States; ultimately, this has resulted in delays in the implementation of the programme; in sum, the political games played have led to delays that currently stand at five years, a considerable budget overrun, and the loss of Galileo's initial technological lead.⁷²

A major concern expressed by the Bush administration had been the possibility that the EU could grant China access to Galileo's Public Regulated Service (PRS) signals. PRS Signals are 'government use only' encrypted signals that can be used for potential military applications and will still be receivable even if all other six Galileo signals are jammed. Initially, there was an overlay of the Galileo PRS signals with one of the signals of the next

69. Commission of the European Communities, 'European Space Policy', Communication from the Commission to the Council and the European Parliament, Brussels, COM(2007) 212 final, 26 April 2007, p. 4.

70. See Jose Carlos Matias, 'Galileo: Europe's great leap outward', *Asia Times*, 19 July 2007, available at: <http://www.atimes.com/atimes/China/IG19Ad01.html> (accessed 1 October 2008); PriceWaterhouseCoopers et al, 'Inception Study to Support the Development of a Business Plan for the GALILEO Programme', TREN/B5/23-2001, 20 November 2001, available at: http://ec.europa.eu/dgs/energy_transport/galileo/doc/gal_exec_summ_final_report_v1_7.pdf.

71. While official estimations still speak of total expense of about €3 billion, experts estimate that the real costs will be about €6 to 8 billion, some speak of even €10 billion. See 'Galileo Costs Launch Into Orbit', *Der Spiegel* online, 14 January 2008, available at: <http://www.spiegel.de/international/europe/0,1518,528441,00.html> (accessed: 1 October 2008).

72. See Giegerich, op. cit. in note 54; Galileo is currently scheduled for 2013.

GPS generation, the military code (M-code) signals. Due to the overlay, access to the PRS would have provided the PRC with an opportunity to jam the US military code that is central in guiding missiles and providing information in wartime. The overlay problem was resolved between the US and the EU after lengthy negotiations in 2004, yet the US has remained doubtful about EU reliability in times of crisis and particularly regarding China.⁷³ Generally, the US administration has expressed reservations about the EU's engagement policy towards the PRC and what it sees as an inefficient export control system. Some US experts such as Griffin and Lin from the American Enterprise Institute and the Jamestown Foundation even blame European technology transfers to China for the failure of the US containment policy that had aimed to halt China's progress in space technology and military modernisation. By subjecting satellite technology to ITAR regulations in the late 1990s, the US had effectively barred the Chinese market from Western launches and hence access to the relevant technologies. Complaints focus on the sales of dual-use technology such as kick motors to China by European companies. These, it is alleged, are responsible for major advancements in Chinese missile technology as has recently been illustrated by China's anti-satellite (ASAT) weapon test in January 2007.⁷⁴

Challenges for collaboration with China also came from the EU humming and hawing about the dual-use nature of the technology and the objective of the project. Being undecided, the EU was vulnerable to external pressure by both the United States and China. The related inability to define from the beginning the scope and limits of the collaboration led to acrimonious discussions about access to the PRS, sub-optimal results of common projects and an ever-shrinking role for China in the project (with resulting delays) with China finally only spending 65 million euro in cash. With almost the whole amount of Chinese investment being spent in China, the remaining 135 million euro contribution will now be used for future applications and in-kind contributions, e.g. by Chinese companies producing for the Chinese market and providing the search-and-rescue payload on Galileo satellites. Following the initial experiences in Sino-European cooperation, China was barred from the Galileo Supervisory Authority (GSA) that replaced the GJU for Galileo's management.⁷⁵

73. The US still emphasises its right to take 'reversible and irreversible action': 'US could shoot down EU satellites if used by foes in wartime', *Agence France-Presse*, 24 October 2004. As Bastian Giegerich points out, 'if jamming does not work and the EU does not turn Galileo off, the US government will shoot down Galileo satellites if they indirectly put American soldiers at risk'. Giegerich, op. cit. in note 54, p. 504.

74. Technology transfer is seen as encompassing equipment as well as engineers in joint project teams. See Christopher Griffin and Joseph E. Lin, 'China's Space ambitions', op. cit. in note 55.

75. Peter B. de Selding, 'China's Role in Galileo Navigation Project Begins to Shrink', *Space News*, 21 June 2004. Available at: http://www.space.com/spaceneews/archive04/chinaarch_061604.html; Peter B. de Selding, 'Galileo Faces more delays, new challenges from China', *Space News Business Report*, 11 December 2006; Peter B. de Selding, 'EU likely to bar China from Galileo Supervisory Authority', *Space News Business Report*, 19 June 2006. Available at: http://www.space.com/spaceneews/archive06/China_061906.html (accessed 6 October 2008).

In the political rush to beef up the ‘strategic partnership’ in 2003, the European side had also failed to gather information on and take into consideration Chinese indigenous initiatives in space technology, in particular the PLA’s Beidou-2, now renamed COMPASS.⁷⁶ The initial forecast of analysts⁷⁷ that China might even consider tailoring its military and civilian satellite technology to the Galileo market – with the enormous opportunities for the Europeans that this would imply – did not materialise. On the contrary, while the EU was still making up its mind about the military aspect of Galileo, the Chinese were busy integrating the information they had absorbed as a member of the GJU into their own system. The heavy investments in space technology seem to have finally paid off for the PRC.⁷⁸ In the bargaining for access to Galileo’s PRS signal China has recently been threatening a possible interference with the M-Code and Galileo.

In summary, it can be said that international collaboration offers ample opportunities, ranging from reinforcing know-how, mitigating risks and increasing interoperability to the strategic aspects of promoting European independence in a key sector for future growth and security and – in the special case of China – of integrating the PRC further into international regimes. Technology transfer in this area therefore serves the goals of European companies and the EU as a whole. However, as space technology is loaded with national security and prestige aspects and countries compete for dual-use technological gains, actors play hardball. While the European Commission did succeed in overcoming resistance to the project by taking the Chinese in, the European Member States were not prepared for the hardball game that followed: there was no preceding common assessment of the interests and state of development of China, the scope of collaboration and the potential dangers. Plus, the EU was hampered by having to play political games due to internal quarrels over competences in security-related areas. Accordingly, the rules of engagement were unclear, and bargaining capital and technological headway was lost. Yet if these weaknesses can be overcome, and the transfer of technology is managed on the basis of a common strategic assessment between EU Member States, Europeans could greatly benefit from collaboration in this growth sector.

76. Interviews with EU officials, Brussels, November 2008.

77. ‘China joins EU’s satellite network’, BBC News, 19 September 2003. Available at: <http://news.bbc.co.uk/go/pr/fr/-/1/hi/business/3121682.stm> (accessed: 11 September 2008).

78. See Kevin Pollpeter, ‘China’s Progress in Space technology during the Tenth 5-Year Plan and the U.S. Response’, Strategic Studies Institute, 21 March 2008. Available at: <http://www.strategicstudiesinstitute.army.mil/pubs/display.dfm?pubID=852>.

Case Study II: Cooperation in aviation – the case of Airbus

In the much more commercialised field of aviation, technology transfer to China has become an integral part of any aircraft-related contract with China. Security concerns are hardly mentioned unless they are brought up by the US. Since the mid-1990s, the EU has promoted technology transfers to China to ‘support modernisation and market-oriented policies in key economic sectors’⁷⁹ such as aerospace, notably through the EU-China Civil Aviation Cooperation Project, one of the largest EU-China economic cooperation projects. Cooperation between European aerospace companies and their Chinese counterparts has been following this line despite the risks of counterfeiting and espionage. As Asia and China have become the new battleground for global leadership,⁸⁰ American and European companies are fiercely competing for market shares. Aiming to secure a strong foothold, they have agreed to ‘onerous conditions [...] by acceding to co-production deals and technology transfers.’⁸¹ Commercial offset agreements including substantial technology transfers have become an integral part of sales. In 2008, the latest of these deals for Airbus included a final A319/A320 assembly line in Tianjin and a joint venture in Harbin for manufacturing composite materials and components.⁸² Yet in the aviation sector, all players are involved in civilian as well as military activities; hence export controls and dual-use concerns meet economic necessities in a highly competitive market.

From the Europeans’ viewpoint opportunities lie in market access and low labour costs, with Asia becoming the hotbed for the growth of the global aerospace industry, spearheaded by the rapid increase in civil aviation in India and China.⁸³ After more than a decade of double-digit growth, China has emerged as the world’s second largest aviation market just after the United States. The PRC constitutes a highly lucrative customer as well as an up-and-coming provider of high-tech manufacturing, with its increas-

79. Commission of the European Communities, ‘A Long Term Policy for China-Europe Relations’, COM(95), 279 final, Brussels, 1995.

80. Nicola Casarini, ‘The Evolution of the EU-China Relationship: From Constructive Engagement to Strategic Partnership’, *Occasional Paper* no. 64, EUISS, Paris, October 2006, p. 27.

81. Steve Beckman, Testimony before the US House Committee on Ways and Means, Subcommittee on Trade, on ‘The Possible Accession of the People’s Republic of China to the WTO’, 19 September 1996.

82. See Jens Flottau, ‘Airbus plans long-term presence in China, starting with Tianjin’, *Aviation Week*, 5 October 2008; see also Wieland Wagner, ‘Playing with fire: Airbus in China’, *Spiegel Online*, 8 May 2006.

83. Global Aerospace Market Forecast (2006-2009), Market Research.com, 1 July 2006. See: <http://www.marketresearch.com/product/display.asp?productid=1316230&g=1> (accessed: 1 October 2008); European Advisory Group on Aerospace, ‘STAR21: Strategic Aerospace Review for the 21st Century. Creating a Coherent Market and Policy Framework for a vital European Industry’, Brussels, European Commission/Enterprise publications, July 2002.

ingly skilled labour force.⁸⁴ The impact of the financial crisis still needs to be seen, but so far studies by Airbus and others expect that the commercial air fleet will grow along with the number of airports, and so be tripled to 4,460 planes by the end of 2026.⁸⁵ Revenues made in the Asian market could in turn be used to spur cutting edge R&D in Europe. While there is a painful shortage of European engineers, the level of China's skilled labour force is rapidly catching up: good value manpower is supplied by a plethora of Western-educated engineers returning home, improving education on the mainland and the accumulated expertise of local engineers acquired after more than two decades of being subcontracted the manufacturing of aircraft parts and maintenance tools of Airbus, Boeing and others. Although there is still some disagreement about quality, an internal study commissioned by EADS showed that Chinese suppliers have caught up with Western standards in most fields and even exceeded Western suppliers in some.⁸⁶

Challenges are primarily of an economic and competitive nature, but there are also security implications. On the economic side, the Chinese leadership is pushing its indigenous aviation industry to draw level with Western competitors. Chinese companies aim to transform from being suppliers to Western companies such as Airbus and Boeing to becoming leading aircraft manufacturers for China's domestic market. In May 2008, Prime Minister Wen Jiabao proudly launched the Commercial Aircraft Corporation of China (CACC)⁸⁷ which continues the existing ARJ21 regional-jet programme⁸⁸ and is working on a Chinese 150-seat single aisle model to be completed by 2020 in order to rival the dominance of Boeing and Airbus. Moreover, non-Chinese companies are still severely hampered by import hurdles and IPR infringements as part of everyday business life.⁸⁹ Nevertheless, driven by fierce competition, the level of technology being transferred is becoming increasingly sophisticated. Companies like Airbus are fully aware that this will help to 'make China our competitor',⁹⁰ yet the

84. 'Sarkozy wins China 20 billion euro deal', BBC News, 26 November 2007. See: <http://news.bbc.co.uk/1/hi/world/asia-pacific/7112500.stm> (accessed: 28 Oct. 2008). 'Airbus hopes to join China's jumbo jet program', Xinhua, 30 May 2008. See: http://www.chinadaily.com.cn/china/2008-05/30/content_6725304.htm (accessed 22 May 2009).

85. 'Airbus: China needs 2,800 aircraft in 20 years', *Chinadaily.com*, 27 April 2008; On 10 December 2008, the Chinese Aviation Authority (CAAC) advised Chinese airlines to defer or where relevant cancel the acquisition of new planes. See: 'China: Airlines sollen Flugzeugbestellungen aufschieben', Reuters.com, 10 December 2008.

86. Interviews with business representatives, Berlin, November 2008.

87. Shareholders include the Chinese central government, the municipal government of Shanghai, Aviation Industry Cooperation I (AVIC I) and AVIC II.

88. This twin-engined regional airliner programme is supported by 19 major US and European aerospace components suppliers, including General Electric (engine production) and Rockwell Collins (avionics production).

89. DG Trade states that barriers to trade in China are estimated to cost EU businesses €21 billion in lost trade opportunities every year. Counterfeit products imitating European brands were reported to account for around 5-10% of turnover in China. DG Trade, China, 'EU-China trade in facts and figures', Memo, Brussels, 30 January 2009.

90. Laurence Barron, President of Airbus China, cited in 'Airbus hopes to join China's jumbo jet program', Xinhua, 30 May 2008.

risk of losing intellectual property is seen as the cost of doing business in China.⁹¹ With stagnating R&D budgets in Europe, it will be another challenge to develop and keep ‘cutting edge’ technology in Europe.

Challenges on the security side arise from the dual nature of aerospace companies that partner with Airbus and others in joint ventures:⁹² there is a general lack of knowledge and information about what China is up to and particularly a lack of a strategic debate on the consequences – both among EU Member States and between the European Union and the United States. The joint venture partner of Airbus in Tianjin and Harbin, AVIC I, also produces 90 percent of the PLA’s airforce equipment, including fighters, bombers, and missiles.⁹³ Cases of diverted end-uses have happened before with AVIC: in 1994, American machine tools used in a Sino-American collaboration with US company Mc Donnell Douglas were diverted and wound up at an AVIC factory producing fighter planes and cruise missiles.⁹⁴ Plus, AVIC I has numerous military subsidiaries that could benefit from access to sensitive high technology. One of them is the Chengdu Aircraft Industry Corporation (CAC) which builds the J-10 (F-10), a fourth generation Chinese fighter first deployed in 2007.⁹⁵ As outlined before, recent US reports on China’s progress state that the Chinese Military Industry (CMI) has been able to catch up with Western standards in most areas. Some Western experts even claim that the CMI seem to have finally been able to overcome the problem of the crucial missing technological expertise in the production of plane engines that up until now had proved an insurmountable obstacle to the manufacture of indigenous Chinese planes.⁹⁶ A strategic debate about China’s dual use activities in this area has so far not taken place and export control regimes have not been adapted accordingly. While the US state department fined Boeing in 2005 for exporting planes that included military-usable QRS11

91. Moises Naim, *Illicit: How smugglers, traffickers and copycats are hijacking the global economy* (London: William Heinemann, 2005); G. M. McDonald and C. Roberts, ‘Product Piracy: the problem will not go away’, *Journal of Product and Brand Management*, vol. 3, no. 4, 1994, pp. 55-65; Gail Tom, Barbara Garibaldi, Yvette Zeng and Julie Pilcher, ‘Consumer demand for counterfeit goods’, *Psychology and Marketing*, vol. 15, no. 5, 1998, pp. 405-21; Tetsuya Jr. Minagawa, Paul Trott and Andreas Hoecht, ‘Counterfeit, imitation, reverse engineering and learning: reflections from Chinese manufacturing firms’, *R&D Management*, vol. 37, no. 5, 2007, pp. 455-67.

92. Xi’an Aircraft Company (XAC) produces fighter planes for the PLA and assembles components for the Airbus A320 as well as for the Boeing 737; see Wieland Wagner, ‘Playing with fire: Airbus in China’, *Spiegel Online*, 8 May 2006.

93. ‘Profile, China Aviation Industry Corporation I’. See: www.avic1.com.cn/English/profile/jtfc_01.htm (accessed 29 October 2008).

94. US General Accounting Office, ‘Export Controls: Sensitive Machine Tool Exports to China’, November 1996. See: www.gao.gov/cgi-bin/getrpt?NSIAD-97-4 (accessed: 29 October 2008).

95. Zhao Huanxin, ‘Home-made Fighter Jet to Add Sky Power’, *China Daily*, 6 January 2007. Available at: http://www.chinadaily.com.cn/china/2007-01/06/content_776078.htm; Annual Report to Congress, ‘Military Power of the People’s Republic of China’, Office of the Secretary of Defense, 2007, p. 4. Available at: www.defenselink.mil/pubs/pdfs/070523-China-Military-Power-final.pdf (accessed: 29 October 2008).

96. However, the claim is still contested; Interviews with high-level officials of US government and British industry representatives, December 2008/May 2009; Richard A. Bitzinger, op. cit. in note 25.

gyroscope microchips,⁹⁷ this is not an issue in the European Union. But European companies such as EADS voluntarily follow US export control rules even when exporting to third countries in order not to jeopardise their business activities in the US.⁹⁸ This situation does not make the EU export control system more credible in US eyes.

In summary, it can be said that with China being the most promising future market, its attractiveness enhanced by a highly-skilled labour force, there is no alternative to cooperation and technology transfer. European companies are quickly learning the ‘Chinese lessons’: they are more aware of the challenges, but also of the need to be represented in China, of the benefits of sharing technology and of partly becoming Chinese companies themselves,⁹⁹ while issues of IPR infringements and continuing market barriers need to be energetically addressed by the European Commission and on the WTO level.¹⁰⁰ Even if Chinese companies are not expected to compete in the international market in the near future, the most important issue for European companies will be to retain the innovative lead by investing in R&D and skilled labour.

As cooperation and transfer of dual-use technology is the rule of the day, the European Union needs to have a better picture of what is going on in China. Given the nature of dual-use technology, security risks will not be avoidable, but they should remain manageable. As in space, cooperation with China also offers more opportunity to keep track of the developments in the Chinese Military Industry (CMI). A better overview of all the information gathered from the different Directorates General of the Commission involved, i.e. DG Trade, DG Innovation, DG TREN etc., could underpin a strategic discussion between the EU Member States on how to handle dual-use transfers and how to adapt export control regimes. A carefully considered proactive policy of the EU in this area could also mediate potential conflicts with the US and hence act to the benefit of European companies that operate between the conflicting priorities of their Asian and US business interests.

97. ‘Boeing sale to China skirts ban on technology transfer’, *The Washington Times*, 4 February 2004; Kriss Chaumont, ‘Boeing Commercial stumbles over defense regulations’, *The Seattle Times*, 6 July 2005.

98. For the assembly line in Tianjin, Airbus sought the ‘green light’ from the US side first. Interview, 13 November 2008.

99. Business representatives like Airbus CEO Tom Enders state that ‘in order to be successful, you need to share – also technology.[...] We want to become a Chinese company also.’ Quoted in Jens Flottau, op. cit. in note 82.

100. In interviews, some experts advised using the Chinese legal system as effectively as possible and also not to file for patent of innovations. Some others suggest that multinational companies (MNCs) might be better advised to nurture collaborative partnerships with local firms instead of focusing on IP infringement prosecution. Tetsuya Jr. Minagawa, Paul Trott and Andreas Hoecht, ‘Counterfeit, imitation, reverse engineering and learning: reflections from Chinese manufacturing firms’, *R&D Management*, vol. 37, no. 5, 2007, p. 456.

Conclusion

In today's post-Cold War world, the old lines between 'good' and 'bad' countries have blurred while the diffusion of technology seems inevitable. Countries like China constitute indispensable partners for Europe in facing global challenges; but they also present some challenges as their future trajectory is still not fully predictable. Given the central role of dual-use technology in modern network-centric warfare, the transfer of sensitive technology to China touches aspects of competitiveness, market access and security at the same time. An endeavour to contain technology as once attempted by the United States has turned out to be futile and even self-damaging.¹⁰¹

International collaboration in dual-use areas, including the transfer of technology, offers numerous economic and strategic opportunities: European companies can benefit from an emerging market and Chinese purchases of Western technologies, as well as from constantly improving skilled labour in times where there is a shortage of engineers and can use the resultant revenues to boost innovation at home in order to stay competitive. Collaboration with China underpins the EU's declared strategy to further dialogue with China and its integration in international trading systems; it also facilitates keeping a clearer track of what is happening within China, in particular in the domain of technological innovation.

On the other hand, cooperation also entails clear challenges: ongoing IPR infringements, remaining trade barriers for European companies, European dual-use technology that ends up in undesired applications, to name just a few. As seen in the case studies, the main challenge has arisen from the inability of the European Union 'to call a spade a spade' – to acknowledge the dual-use nature of these technologies and hence to discuss cooperation upfront with China as part of a sincerely strategic approach. In these days of global financial crisis, governments tend to resort even more to measures of protectionism and nationalist retrenchment. Therefore, on the economic side, the EU needs to keep up the political pressure to level the playing field with China in trade issues. However, this will be a tough and tedious process which will only yield results in the long term. In the meantime, European companies have started to develop their own ways of coping with the conditions in China while governments aim to raise awareness of the dangers of dual-use technology being diverted to improper end uses. Risks in cooperation with China will always exist but they are manageable.

101. See also 'Earthbound: Gravity is not the main obstacle for America's space business. Government is', *The Economist*, 21 August 2008.

The European Union needs to address these challenges via a proactive policy of ‘managing risks’. This policy needs to result from an EU strategic debate based on more knowledge about the development and future role of China and its implications for EU policies as a whole. This debate will have to find a way of rising above the traditional separation of competences and has to take into account all policy fields of the EU that are affected by China’s rise – from competition to security to transatlantic relations. This should be the nucleus for a better exchange of information about China between the pillars, the European capitals and Brussels. Finally, this process needs to result in a reform of the European export control system; a reformed export control system, based on this strategic vision, would aim to remove unnecessary obstacles that prevent Europe from benefiting from China’s rise, but would enable Europe to keep an eye on the concomitant risks and make the EU more credible in related discussions with the United States. Against this strategic background, the EU needs to continue its engagement policy with China in order to retain some sort of influence on the directions China will take in its historic emergence as a major power, including its rise as a military might, and to keep track of developments there.

In a study for the US Army, the analyst Kevin Pollpeter examined four policy options for the United States regarding China’s progress in space: containment, competition, cooperation and doing nothing.¹⁰² He concluded that there is no credible alternative to cooperation with China. In his view, the US response should take a balanced approach to manage the challenges while exploiting the opportunities. Cooperation therefore could improve scientific research, increase transparency and trust and lessen competitive aspects that may lead to armed conflict.¹⁰³ The change in US policy towards dual-use technology transfers to China is evidence of one attempt to address this changed environment in a post-Cold War world. Although there may still be room for improvement in the implementation of this policy,¹⁰⁴ American endeavours might yet inspire the Member States of the European Union to respond by actively developing and pursuing on the European level a common policy of ‘managing risks’ when dealing with China and sensitive transfers in high technology. They have not done so thus far.¹⁰⁵

102. See Kevin Pollpeter, ‘Building for the Future: China’s Progress in Space Technology during the Tenth 5-Year Plan and the US Response’, Strategic Studies Institute, March 2008. Available at: <http://www.strategicstudiesinstitute.army.mil/pdffiles/PUB852.pdf>, pp. ix-x.

103. Ibid.

104. For a critical account, see: Government Accountability Office of the United States (GAO), *High-Risk Series: An Update*, GAO-09-271, Washington, D.C., 22 January 2009. Available at: <http://www.gao.gov/htext/d09271.html>; see also, GAO, *Export Controls: Challenges with Commerce’s Validated-End User Program May Limit Its Ability to Ensure That Semiconductor Equipment Exported to China Is Used as Intended*, Washington, D.C., 25 September 2008. Available at: <http://www.gao.gov/products/GAO-08-1095> (accessed 6 October 2009).

105. Interviews with US officials in Washington D.C., April 2009.

Recommendations:

The European Union should therefore:

1. work towards a common European strategic assessment of China's future global role and the implications for EU policies. It is up to the political leaders to provide a vision and hence a framework for European business to operate within, based on a comprehensive assessment of China's rise that includes strategic implications for the EU's China policy. This, in turn, should promote a reform of the European export control system, also addressing the current 'Chinese loophole', Article 4 of the EU regime of export control of dual-use goods and technologies. In order to formulate a security perspective on China, it will be essential to further intelligence exchange between Member States and to build up a shared knowledge base on China with a particular focus on its military development and its foreign policy agenda. As a common assessment seems to be almost impossible to achieve among national and Brussels-based officials due to the sensitivity of the issue, a starting point could be a series of track-two seminars to identify convergences in approaches in close cooperation with track-one officials. Again on track-two level, a core group of Member States that want to spearhead the process should produce a strategic outlook on China.

2. strive to ameliorate the internal coordination of EU external policy-making that promotes the integration of commercial *and* security aspects of future technologies and policies. The inability of a pillar-structured 'imperfect union' to discuss issues from all perspectives concerned, be it commercial or security-related, and decide on common guidelines, has had a detrimental impact on Europe's technological lead in the case of the Galileo satellite navigation system. These shortcomings, the delayed and overly time-consuming decision-making procedures and the cacophony of voices of the different national and European institutions involved could be improved by effectively implementing the provisions of the Lisbon Treaty regarding a new High Representative of the Union for Foreign Affairs and Security Policy who would also be 'double-hatted' as Vice-President of the Commission.

3. continue to engage with China in these future technologies as well as in non-proliferation efforts in order to bind China further in as a responsible stakeholder in international affairs; to obtain more knowledge about China's development in dual-use programmes; and so as to benefit, in the long run, from China's investments and progress in these high technology fields – while beefing up investments in education and research with the European Union. This proactive approach requires a realistic rethinking of the framework of cooperation, including reformulating the regulations

for joint research projects (e.g. who gets the IPR?), employing increased political pressure in order to level the playing field, and raising awareness of the transfer of knowledge, for example through cross-border education and training.

Annex

Abbreviations

ASAT	Anti-Satellite
CMI	Chinese Military Industry
CWC	Chemical Weapons Convention
DG TREN	Directorate General for Energy and Transport
ECO	Export Control Organisation
EDA	European Defence Agency
ERA	European Research Area
GAD	General Armaments Department
GDP	Gross Domestic Product
GJU	Galileo Joint Undertaking
GPS	Global Positioning System
GWOT	Global War on Terror
IPR	Intellectual Property Rights
ITAR	International Traffic in Arms Regulations
MNC	Multinational Corporations
MOST	Ministry of Science and Technology
MTCR	Missile Technology Control Regime
NSG	Nuclear Suppliers Group
OECD	Organisation for Economic Co-operation and Development
PLA	People's Liberation Army
pMS	Participating Member States
PRC	People's Republic of China
PRS	Public Regulated Service
RMA	Revolution in Military Affairs
R&D	Research and Development
R&T	Research and Technology
UN	United Nations
USD	US dollars
VEU	Validated End User
WTO	World Trade Organisation

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