

CHINA'S EMERGENT MILITARY AEROSPACE AND COMMERCIAL AVIATION CAPABILITIES

HEARING

BEFORE THE

U.S.-CHINA ECONOMIC AND SECURITY
REVIEW COMMISSION

ONE HUNDRED ELEVENTH CONGRESS
SECOND SESSION

May 20, 2010

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WASHINGTON : June 2010

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The Commission was created on October 30, 2000 by the Floyd D. Spence National Defense Authorization Act for 2001 § 1238, Public Law No. 106-398, 114 STAT. 1654A-334 (2000) (codified at 22 U.S.C. § 7002 (2001), as amended by the Treasury and General Government Appropriations Act for 2002 § 645 (regarding employment status of staff) & § 648 (regarding changing annual report due date from March to June), Public Law No. 107-67, 115 STAT. 514 (Nov. 12, 2001); as amended by Division P of the "Consolidated Appropriations Resolution, 2003," Pub L. No. 108-7 (Feb. 20, 2003) (regarding Commission name change, terms of Commissioners, and responsibilities of Commission); as amended by Public Law No. 109-108 (H.R. 2862) (Nov. 22, 2005) (regarding responsibilities of Commission and applicability of FACA); as amended by Division J of the "Consolidated Appropriations Act, 2008," Public Law No. 110-161 (December 26, 2007) (regarding responsibilities of the Commission, and changing the Annual Report due date from June to December).

The Commission's full charter is available at www.uscc.gov.

July 21, 2010

The Honorable DANIEL INOUE
President Pro Tempore of the Senate, Washington, D.C. 20510
The Honorable NANCY PELOSI
Speaker of the House of Representatives, Washington, D.C. 20515

DEAR SENATOR INOUE AND SPEAKER PELOSI:

We are pleased to transmit the record of our May 20, 2010 public hearing on “*China’s Emergent Military Aerospace and Commercial Aviation Capabilities.*” The Floyd D. Spence National Defense Authorization Act (amended by Pub. L. No. 109-108, section 635(a)) provides the basis for this hearing.

During the hearing, the Commission received testimony from Congressman **Roscoe G. Bartlett** (R-MD). Congressman Bartlett provided his perspective on what China’s efforts to modernize its aviation capabilities means for regional and global security.

Representatives from the Executive Branch and expert witnesses described to the Commission recent developments in China’s military aerospace capabilities. According to then-Deputy Under Secretary of the Air Force for International Affairs **Bruce S. Lemkin**, although the Chinese Air Force still lagged behind the U.S. Air Force, China has greatly improved its long-range air defense, electronic warfare, computer network attack efforts and offensive strike capabilities. **Wayne Ulman**, China issue manager at the U.S. Air Force’s National Air and Space Intelligence Center, detailed the “dramatic changes [that] have occurred in the areas of mission, personnel, training, and equipment” in China’s Air Force. **Mark Stokes**, executive director of the Project 2049 Institute, told the Commission how China relies upon its expanding conventional ballistic and cruise missile arsenal to close the gap between the Chinese military and more advanced militaries. **Roger Cliff**, senior political scientist at the RAND Corporation, felt that because of these modernization efforts, the Chinese Air Force could present a “substantial obstacle to the United States” in the event of a conflict between the two militaries. Focusing on how China’s growing missile arsenal could affect the U.S. military, **Jeff Hagen**, senior engineer at the RAND Corporation, described to the Commission how RAND research demonstrated that the Chinese military, relying predominantly on conventional missile strikes, could potentially disable most U.S. Air Force bases in the region. **Rebecca A. Grant**, director of the Mitchell Institute for Airpower Studies, opined that China’s highly capable air defense systems and numerically superior fighters would pose serious problems to U.S. military aircraft in the region.

Panelists also described the current developments and future trends of China’s aviation industrial base. **Peder Andersen**, international trade analyst for aerospace at the U.S. International Trade Commission, described how Beijing has prioritized the development of an indigenous civil aircraft industry and reorganized its aviation manufacturing industry to support this goal. Agreeing with Mr. Andersen, **Tai Ming Cheung**, associate adjunct professor at the School of International Relations and Pacific Studies, University of California, San Diego, told the Commission that China is “pursuing an ambitious strategy to build an internationally competitive, innovative, and comprehensive aviation design and manufacturing base within the next one to two decades.” Focusing on recent developments, **Richard D. Fisher, Jr.**, senior fellow at the International Assessment and Strategy Center, explained the interconnectedness between China’s civil and military aviation industrial bases.

The Commission also heard about the implications of a growing Chinese aviation industrial base for the United States. Addressing the current state of U.S. aerospace industry, Deputy Assistant Secretary of Commerce for Manufacturing and Services **Mary H. Saunders** told the Commission that while China is an increasingly important consumer of aerospace products and services, U.S. aerospace manufacturers face several obstacles in the market. In particular, she highlighted such challenges as the relationship between civil and military aviation production in China, the direction of Chinese aerospace industrial policy, and the extent of unfair Chinese subsidies to the aerospace sector. Expert witnesses disagreed, however, on the specifics of how the U.S. industrial base would be affected. **Owen E. Herrstadt**, director of trade and globalization at the International Association of Machinists and Aerospace Workers, felt that the U.S. industrial base would permanently suffer since U.S. companies were increasingly outsourcing aerospace jobs and know-how to China. Disagreeing with Mr. Herrstadt, **Daniel K. Elwell**, vice president for the Aerospace Industries Association, argued that the growth in China's demand for civil aircraft over the next 20 years would be enough to split opportunities between both China and the United States.

Thank you for your consideration of this summary of the Commission's hearing. We note that the prepared statements submitted by the witnesses are now available on the Commission's website at www.uscc.gov. The full transcript of the hearing will be available shortly.

Members of the Commission are also available to provide more detailed briefings. We hope these materials will be helpful to the Congress as it continues its assessment of U.S.-China relations and their impact on U.S. security. Per statutory mandate, the Commission will examine in greater depth these and other issues in its Annual Report that will be submitted to Congress in November 2010. Should you have any questions, please feel free to have your staff contact Jonathan Weston, the Commission's Congressional Liaison, at (202) 624-1487.

Sincerely yours,



Daniel M. Slane
Chairman



Carolyn Bartholomew
Vice Chairman

cc: Members of Congress and Congressional Staff

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CHINA'S EMERGENT MILITARY AEROSPACE AND COMMERCIAL AVIATION CAPABILITIES

THURSDAY, MAY 20, 2010

U.S. CHINA ECONOMIC AND SECURITY REVIEW COMMISSION
Washington, DC

The Commission met in Room 562, Dirksen Senate Office Building, Washington, DC at 9:20 a.m., Vice Chairman Carolyn Bartholomew, and Commissioners Daniel A. Blumenthal and Peter Videnieks, Hearing Co-chairs presiding.

OPENING REMARKS OF COMMISSIONER DANIEL A. BLUMENTHAL, HEARING CO-CHAIR

HEARING CO-CHAIR BLUMENTHAL: Good morning, everybody, and welcome to our fifth hearing this year. Today we're going to discuss the emerging aerospace capabilities and the future trends of the Chinese aerospace, both market as well as military capabilities, and what the implications are for United States security and our commercial well-being and interests.

For over two decades, the People's Liberation Army has been attempting to modernize its aerospace capabilities. As China's white paper said last year, the PLA Air Force seeks to transition from a territorial-based air defense force to one capable of both farther out offensive and defensive operations.

To this end, it continues to develop or buy or license new combat aircraft, missile defense capabilities, command and control systems, improve pilot training and quality of its personnel, and strengthen its logistics as well as equipment support capabilities. They're not just future aspirations. In recent years, the PLA has made demonstrable strides in that direction.

In addition to its traditional air capabilities, China is rapidly improving its missile forces, its missile capabilities. According to DoD, China is the most active developer of missiles in the world, seeking to improve and increase its ballistic and cruise missile repertoire and arsenal.

In addition to China's 1,200, and growing, short-range ballistic missiles that are mostly pointed across the Taiwan Strait, the PLA is increasing the number of mobile medium-range ballistic missiles as well, capable of striking over 1,700 kilometers from China's borders.

Taken together, these airspace modernization efforts are eroding the long-established favorable air balance the United States and its allies have maintained in the region.

In the United States, a decreased focus on future generation air superiority or air supremacy capabilities is allowing Beijing to slowly erode that favorable balance, which has underwritten the peace and stability of Asia over the last 30 years or so.

One notable example is China's recent announcement that it is on track to have its own fifth generation aircraft capability within the next decade. Advances in China's missile forces means that U.S. forward deployed bases, which has been sine qui non of our stability in Asia-Pacific, are no longer sanctuaries like they once were.

And our allies in the region and partners are starting to become threatened and insecure about our own ability to maintain the peace in Asia. Just about every ally, including Japan, Singapore, Australia, new partners like India, all are focusing very much on their own tactical air force capabilities and upgrades, partly in reaction to China and partly, I believe, in reaction to the fact that our own capabilities are eroding.

To help us better understand these issues, we will be joined today by a number of experts from the administration, from academia and private organizations.

In particular, to start off, we are delighted that the administration, the U.S. government, has sent Bruce Lemkin, Deputy Under Secretary of the Air Force for International Affairs, and Mary Sanders, Deputy Assistant Secretary of Commerce for Manufacturing and Services, to present the government's perspective.

I now turn the hearing over to Commissioner Videnieks for his opening statement.

OPENING REMARKS OF COMMISSIONER PETER VIDENIEKS, HEARING CO-CHAIR

HEARING CO-CHAIR VIDENIEKS: Thank you, Commissioner Blumenthal, and thanks to our witnesses for being here today to help us understand China's aerospace capabilities and their impact on the United States.

As many of you know, the Commission was established to examine eight areas of the U.S.-China relationship. Today's hearing touches upon two of those eight mandates. The first is regional security impact of China's military modernization, which my colleague already addressed in his opening statement.

Today's hearing also addresses the second of our eight congressionally-stipulated mandates: the effects of economic transfers

from the U.S. to the People's Republic of China. This mandate directs the Commission to examine, and I quote, "the qualitative and quantitative nature of the transfer of the United States production activities to People's Republic of China."

It is clear that Beijing desires to become a major player in commercial aircraft manufacturing. China's current Five Year Plan prioritizes the development of commercial aircraft. This year, China will roll out its first indigenously developed commercial aircraft, the ARJ-21. Beijing is also developing a larger commercial aircraft, the C919. In addition to producing its own aircraft, China is also increasing its ability to produce components for Western aircraft firms such as Boeing.

Yet, this substantial progress could not have been accomplished without the support of Western firms. U.S. aerospace manufacturers have moved production and assembly facilities to China. Furthermore, U.S. firms are also bidding on and winning contracts to provide components and advice to China's nascent commercial aircraft manufacturing industry.

A subsidiary of GE, for example, recently won the contract to supply engines for China's future C919. As James McGregor, former chairman of the American Chamber of Commerce in China, pointed out yesterday in a Washington Post op-ed, quote, "China's policies and initiatives [are] aimed at building national champion companies through subsidies and preferred policies while using China's market power to appropriate foreign technology."

How will the growth of China's commercial aviation industry affect the United States? Does the movement of aerospace production facilities to China help China produce competitive commercial aircraft? How might the transfer of high tech aerospace manufacturing jobs, a cornerstone of the U.S. economy, to China impact U.S. national security?

These are some of the questions we would like to have answered during today's hearing. I would also like to point out that later this afternoon Congressman Bartlett from Maryland will be stopping by to provide his remarks on this important topic.

We thank you all for participating, and we will begin with the administration panel.

PANEL I: ADMINISTRATION PERSPECTIVES

HEARING CO-CHAIR BLUMENTHAL: Thank you very much.

As we said before, we're delighted to start off with the administration perspective. We have Deputy Under Secretary Lemkin

here who heads the International Affairs Division of the Air Force, where he provides policy oversight and guidance to international programs supporting national security objectives that he supports through politico-military affairs, security assistance, technology and information disclosure, education and training, and attaché affairs, which he oversees.

Mr. Lemkin is a graduate of the Naval Academy. I guess to show the jointness of our forces, he's moved over to run things in the Air Force. He has served in several senior positions with the Navy, Air Force and the Joint Staff. We're delighted to have him here.

Deputy Assistant Secretary Saunders manages the day-to-day operations of industry specialists, economists and international trade experts who work in the International Trade Administration's Manufacturing and Services Division.

Ms. Saunders has an extensive career with the Commerce Department and has managed programs to advance U.S. business and technology interests in the EU, Russia and the Newly Independent States, China and Japan.

Ms. Saunders has also held a variety of positions in the Department of the Army, Office of Institutional Research at the U.S. Military Academy.

We're honored, both of you, for taking your time from your business schedule to have you here this morning. Either one of you can go first. I'll call on you. Mr. Lemkin.

**STATEMENT OF MR. BRUCE S. LEMKIN
DEPUTY UNDER SECRETARY OF THE AIR FORCE,
WASHINGTON, DC**

MR. LEMKIN: Commissioner Blumenthal, Commissioner Videnieks, members of the Commission, thank you for your invitation to testify and present the views of the Department of the Air Force on the progress of China and its attempt to field a modern Air Force.

I appreciate the opportunity to discuss the U.S. Air Force relationships with China and Taiwan and our strategy and efforts to strengthen relationships that enhance regional security.

In my capacity as the Deputy Under Secretary of the Air Force, International Affairs, I am charged with leading U.S. Air Force efforts to build Air Force-to-Air Force relationships, partnerships, and partnership capacity, including mutually beneficial interoperable air and space capabilities.

I am responsible for developing and implementing political-military policy that is consistent with U.S. government objectives and

policy goals that we articulate in the U.S. Air Force Global Partnership Strategy that we actually write.

I'm also charged with Interagency coordination, development and oversight of U.S. Air Force International Affairs Specialists and the U.S. Air Force Attaché Program. Additionally, my organization manages foreign disclosure and export control for the Air Force. Of particular interest to this Commission, I'm responsible for the U.S. Air Force programs that assist Taiwan in maintaining a sufficient self-defense capability consistent with the Taiwan Relations Act.

I do have direct, significant experience in engaging with China that predates my current assignment. Thirteen years ago, as Chief of the Asia-Pacific Division on The Joint Staff, I had a key role in authoring and negotiating the U.S.-PRC Military Maritime Consultative Agreement, still the only military-to-military agreement between the U.S. and China.

As head of the U.S. delegation to the Tension Reduction Subcommittee of the Four Party Talks--that was the U.S., Republic of Korea, the PRC, and the DPRK--in Geneva in the late '90s, I found the Chinese delegation to be generally positive and work to produce progress in achieving our goal of lessening tensions on the Korean Peninsula.

I guess that worked out well.

Among our goals in engaging with China is to develop greater mutual understanding, which in turn helps to build mutual trust through a continuous process of dialogue aimed at improving communications to reduce the risk of miscalculation and to promote regional security.

A recent experience is relevant. In March of this year, I was the senior U.S. representative at celebrations marking the 80th anniversary of the Chilean Air Force. The PRC representative was a PLA Air Force Lieutenant General. In our discussions on the side bars of the related events, we agreed that both nations need more dialogue and senior leader engagement, and that such talks would be mutually beneficial.

I emphasized the need for greater transparency in terms of military capabilities, budget and intentions on the part of China. We are hopeful that China will join us in seeking future senior level engagement opportunities.

Undoubtedly, China is determined to increase its military capabilities across the board including aerospace and ballistic missile forces. While the PRC military continues to lag U.S. forces from a technology standpoint, they are rapidly improving their long-range air defense systems, electronic warfare, computer network attack efforts, and offensive strike capabilities.

Additionally, China is improving its training regimen to better

utilize the technology of their forces now in the field. The U.S. must stay ahead of the game and maintain our ability to deter or, if necessary, defeat and attack.

Just as we build relationships with our international partners, China, too, has built relationships. Many of these affiliations are commercial in nature, such as in Africa, and some have both a commercial and a security component to them such as with Iran.

In some cases, while beneficial from a financial standpoint, these relationships are counterproductive to our joint security interests. I think it is interesting to note and ponder the fact that South America is the largest recipient of Chinese overseas investment.

In the Asia-Pacific region, while some might argue that we have few common goals, I believe that it is in the best interests of both the United States and China to ensure an environment of security and stability that fosters economic and social development.

The stated policy of the United States is to create a positive, cooperative, and comprehensive relationship with China, capable of addressing common global challenges and advocating shared interests.

In the military realm, we wish to work with the PRC to develop a stable and reliable military-to-military relationship, a relationship which upholds the values of freedom of commercial and military movement, addresses common security challenges such as terrorism, piracy and proliferation, and fosters stability in the region.

There are multiple challenges that we must face before arriving at this vision. Today, China's growing presence and influence in the regional and global economic and security affairs has not been matched with an increasing transparency about the pace, scope and ultimate aims of its military modernization programs.

This creates the potential for misunderstanding of China's strategic intentions, not just with the U.S., but with the region as a whole. Cooperation is further hampered by the on again/off again cycle that has characterized the relationship in recent years.

The U.S. must continue to work with allies and partners to ensure and promote stability, prosperity, universal values and an international order that promotes integrated cooperative action to address regional security concerns.

Close collaboration with allies and partners in the region is required to avert crises and respond when action is required. A constructive relationship with China would do much in ensuring a stable and prosperous East Asia.

In regard to our other allies and partners, the U.S. has a lengthy history of involvement in the Asia-Pacific region, and we seek to continue to strengthen our existing partnerships and alliances in the

Pacific.

Our current presence in Asia rests firmly on our historical treaty alliances and other agreements with countries in the region. We reaffirm the U.S. commitment to our allies through our forward-stationed and deployed forces that serve as an important contribution to regional security.

We also seek to uphold our commitments as outlined in the Taiwan Relations Act. In addition, we endeavor to build the capacity of our partners to respond to humanitarian crises and natural disasters in the region.

The United States welcomes a strong, prosperous and successful China that plays a greater, more productive global role, and welcomes the benefits that can be obtained through greater cooperation between our two countries. The U.S. and China should work to maintain open channels of communication in order to expand these areas where we can cooperate and manage differences that are present in any complex and multi-level bilateral relationship.

We have a strong interest in ensuring a stable cross-Strait relationship. Here, U.S. policy with respect to Taiwan has been consistent and clear based on our one-China policy, the three Joint U.S.-China Communiqués, and the Taiwan Relations Act.

By fulfilling our commitments as outlined in the Taiwan Relations Act, we ensure that Taiwan can remain strong and confident, free from threats or intimidation to pursue further engagement and peaceful dialogue with the PRC.

A comprehensive modernization effort that began in the early '90s has transformed China's military into a capable force with a mix of advanced weapon systems and numerical superiority over their neighbors, but the People's Liberation Army Air Force remains a regional air force with a limited capability to project airpower more than a few hundred nautical miles off China's coast.

However, China does not rely solely on airpower to project influence in the near-abroad. They have developed a broad range of technologies as part of what appears to be a larger anti-access/ area-denial strategy centered on asymmetric capabilities.

Ballistic missiles are China's primary prompt, long-range offensive weapon. They have one of the most active development programs in the world and the largest deployed conventional ballistic missile force of any nation. More than 1,000 short and intermediate-range missiles with a variety of ranges, payloads and capabilities are currently based in southeastern China.

Specialized warheads include runway penetrators, anti-radar seekers, and anti-ship payloads designed to threaten large naval vessels

such as aircraft carriers. Taken together, ballistic missiles and cruise missiles provide China with a dual-pronged capability to strike almost any regional target to include airfields, ports, ships, military bases, logistics nodes, command and control facilities, and industrial economic centers.

Chinese military writings also reflect a comprehensive understanding of information operations and their importance in modern conflict. Toward these ends, China is building its space, counter-space and electronic warfare capabilities. China is developing a large and diverse array of jammers and anti-satellite weapons to provide the capability to deny situational awareness through foreign military personnel, commanders and civilian leaders. Another growing concern is cyber warfare. It threatens the integrity of military and civilian information systems around the world in ways that are still not entirely understood.

China has not ignored self-defense while developing its regional force projection capabilities and has built one of the world's most robust integrated air defense systems.

China's large numbers of fourth generation fighters and tightly integrated web of advanced sensors and air defense weapons pose a difficult challenge for even the most modern air forces in the region.

As an emerging power, China's global presence and engagement have increased significantly over the last two decades, in fact, with significant political, economic and military ramifications for the international environments.

Politically, China has moved from a state operating somewhat outside the international system to a full and active participant in global institutions and a generally constructive player. Rarely, though, and only with reluctance will China accept the mantle of leadership on the global stage. With the world's third-largest economy, China's influence on the global economy is enormous.

China has some level of economic engagement with virtually every country in the world. Additionally, China was able to avoid the worst of the recent global financial crisis and emerge from it with even stronger economic power than before.

On the military front, the frequency and scope of the People's Liberation Army interaction with foreign militaries have expanded since 2002 as well. Through global military engagement, China seeks to enhance its power by cultivating foreign relationships, bolstering its international image, and assuaging the concerns of countries wary of China's rise.

The PLA sends more than 100 delegations a year abroad and maintains a regular presence with approximately 100 countries. Their

participation in bilateral and multilateral exercises and operations is increasing as well.

The PLA currently contributes troops to 18 United Nations peacekeeping operations and its involvement with international humanitarian and disaster relief efforts, such as Haiti, is growing. The PLA Navy is maintaining a three-ship contingent off the Horn of Africa to help combat piracy as well.

China's burgeoning indigenous defense industry allows Beijing to generate revenue and enhance foreign relationships via arm sales. They have sold more than 10 billion in arms to customers all over the world since 2005.

So the U.S. Air Force continues to--let me say in conclusion--the U.S. Air Force continues to seek opportunities to develop and strengthen partnerships around the world and to enhance our long-term capabilities through security cooperation.

The U.S. Air Force continuous forward presence serves as reassurance to our allies and partners in the region of America's commitment to their security, while it also encourages their enhanced security roles and facilitates regular multilateral security cooperation within the region.

In our Global Partnership Strategy, the Air Force has outlined a path to cultivate these key partnerships, nurture our global relations and fortify our geographic access, safety and security around the world.

Our strategy seeks to develop partners that are able to defend their respective territories while ensuring development of interoperability and integration necessary for coalition operations.

Again, thank you for the opportunity to testify today on these important issues. I look forward to your questions.

[The statement follows:]

**Prepared Statement of Mr. Bruce S. Lemkin
Deputy Under Secretary of The Air Force, Washington, DC**

Commissioner Blumenthal, Commissioner Videnieks, and members of the Commission, thank you for your invitation to testify and present the views of the Department of the Air Force on the progress of China and its attempt to field a modern air force. I appreciate the opportunity to discuss the US Air Force relationships with China and Taiwan and our strategy and efforts to strengthen relationships that to enhance regional security.

In my capacity as Deputy Under Secretary of the Air Force, International Affairs, I am charged with leading US Air Force efforts to build Air Force-to-Air Force relationships, partnerships, and partnership capacity, including mutually beneficial, interoperable air and space capabilities. I am responsible for developing and implementing pol-mil policy that is consistent with US government objectives and policy goals, articulated in the USAF Global Partnership Strategy that we write, as well as Interagency coordination, development and oversight of US Air Force International Affairs Specialists

and the USAF attaché program. Additionally, my organization manages foreign disclosure and export control for the Air Force. Of particular interest to this Commission, I am responsible for the US Air Force programs that assist Taiwan in maintaining a sufficient self-defense capability, consistent with the Taiwan Relations Act.

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Among our goals in engaging with China is to develop greater mutual understanding which, in turn, helps to build mutual trust, through a continuous process of dialogue aimed at improving communications to reduce the risk of miscalculation and to promote regional security. A recent experience is relevant. In March of this year, I was the US representative to celebrations marking the 80th anniversary of the Chilean Air Force. The PRC representative was a PLA Air Force Lieutenant General. In our discussions on the side-bars of the related events, we agreed that both nations need more dialogue and senior leader engagement, and that such talks would be mutually beneficial. I emphasized the need for greater transparency, in terms of military capabilities, budget, and intentions on the part of China. We are hopeful that China will join us in seeking future senior-level engagement opportunities.

Undoubtedly, China is determined to increase its military capabilities across the board, including aerospace and ballistic missile forces. While the PRC military continues to lag US forces from a technology standpoint, they are rapidly improving their long-range air defense systems, electronic warfare, computer network attack efforts, and offensive strike capabilities. Additionally, China is improving its training regimen, to better utilize the technology of their forces now in the field. The US must stay ahead of the game, and maintain our ability to deter or, if necessary, defeat an attack.

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In the Asia-Pacific region, while some might argue that we have few common goals, I believe that it is in the best interests of both the United States and China to ensure an environment of security and stability that fosters economic and social development.

US Priorities, Goals, and Challenges

The stated policy of the United States is to create a positive, cooperative, and comprehensive relationship with China, capable of addressing common global challenges and advocating shared interests.

In the military realm, we wish to work with the PRC to develop a stable and reliable military-to-military relationship—a relationship which upholds the values of freedom of commercial/military movement, addresses common security challenges such as terrorism, piracy, and proliferation, and fosters stability in the region.

There are multiple challenges that we must face before arriving at this vision. Today, China's growing presence and influence in regional/global economic and security affairs has not been matched with an increasing transparency about the pace, scope, and ultimate aims of its military modernization programs. This creates the potential for misunderstanding of China's strategic intentions, not just with the US but with the region as a whole. Cooperation is further hampered by the "on again/off again" cycle that has characterized the relationship in recent years.

The recent issuance of the Quadrennial Defense Review (QDR) also highlighted some US priorities as they relate to the region. The continued process of globalization and the rise of non-state actors have ushered in a complex and uncertain security landscape. Other states, including China and India, are rising to greater prominence on the world stage and beginning to shape a changing international system. The U.S. must continue to work with allies and partners to ensure and promote stability, prosperity, universal values, and an international order that promotes integrated cooperative action to address regional security concerns. Close collaboration with allies and partners in the region is required to avert crises and respond when action is required. A constructive relationship with China would do much in ensuring a stable, prosperous East Asia.

In regard to our other allies and partners, the U.S. has a lengthy history of involvement in the Asia-Pacific region, and we seek to continue to strengthen our existing partnerships and alliances in the Pacific. Our current presence in Asia rests firmly on our historical treaty alliances and other agreements with countries in the region. We reaffirm the U.S. commitment to our allies through our forward-stationed and deployed forces that serve an important contribution to regional security. We are working to increase partner participation in security cooperation frameworks within the region in order to increase trust and transparency and reduce the risk of conflict. The U.S. remains committed to assisting Japan and the Republic of Korea in deterring threats and aggression, as we adapt our defense presence to better ensure regional stability. This includes the advancement of the Republic of Korea's lead role in the combined defense of its territory, the continued implementation of the Realignment Roadmap with Japan, and the institution of Guam as a regional hub for security activities in the Western Pacific. We also seek to uphold our commitments as outlined in the Taiwan Relations Act (TRA). In addition, we endeavor to build the capacity of partners to respond to humanitarian crises and natural disasters in the region.

China, in particular, is a growing regional and global economic and security power, and has influenced much of the evolving strategic landscape of East Asia. China's military has grown in terms of both capabilities and mission scope as the country has increasingly pursued regional and global interests. The United States welcomes a strong, prosperous, and successful China that plays a greater, more productive global role, and welcomes the benefits that can be obtained through greater cooperation between our two countries. The U.S. and China should work to maintain open channels of communication in order to expand these areas where we can cooperate and manage differences that are present in any complex and multilevel bilateral relationship.

We have a strong interest in ensuring a stable cross-Strait relationship. Here, US policy with respect to Taiwan has been consistent and clear, based on our one-China policy, the three Joint US-China Communiqués and the Taiwan Relations Act. We welcome the relaxed tensions and the expanded program of cross-Strait exchanges, to include trade, tourism, and other economic links. By fulfilling our commitments as outlined in the TRA, we ensure that Taiwan can remain strong and confident, free from threats or intimidation, to pursue further engagement and peaceful dialogue with the PRC.

China's Military Modernization and Force Projection

A comprehensive modernization effort that began in the early nineties has transformed China's military into a capable force with a mix of advanced weapon systems and numerical superiority over their neighbors, but the People's Liberation Army Air Force (PLAAF) remains a regional air force with a limited capability to project airpower more than a few hundred nautical miles off China's coast. However, China does not rely solely on airpower to project influence in the near-abroad. They have developed a

broad range of technologies as part of what appears to be a larger anti-access/area-denial strategy centered on asymmetric capabilities.

Ballistic missiles are China's primary prompt, long-range offensive weapon. They have one of the most active development programs in the world and the largest deployed conventional ballistic missile force of any nation. More than 1,000 short- and intermediate-range missiles with a variety of ranges, payloads and capabilities are currently based in southeastern China. Specialized warheads include runway penetrators, anti-radar seekers, and anti-ship payloads designed to threaten large naval vessels such as aircraft carriers. Taken together, ballistic missiles and cruise missiles provide China with a dual-pronged capability to strike almost any regional target, to include airfields, ports, ships, military bases, logistics nodes, command and control facilities and industrial/economic centers.

Chinese military writings also reflect a comprehensive understanding of information operations and their importance in modern conflict. Toward these ends, China is building its space, counterspace and electronic warfare capabilities. China is developing a large and diverse array of jammers and anti-satellite weapons provide the capability to deny situational awareness to foreign military personnel, commanders and civilian leaders. Another growing concern is cyber warfare, threatening the integrity of military and civilian information systems around the world in ways still not entirely understood.

China has not ignored self-defense while developing its regional force projection capabilities and has built one of the world's most robust integrated air defense systems. China's large numbers of fourth generation fighters and tightly integrated web of advanced sensors and air defense weapons pose a difficult challenge for even the most modern air forces in the region.

Most current PLAAF missions are satisfied by these regional capabilities, but emerging requirements to support what PRC President Hu termed "New Historic Missions", such as protecting China's interests worldwide, is causing the PLAAF to develop its role as an expeditionary air force. To achieve a force projection capability on a wider scale, the PLAAF will need to develop its strategic airlift, long-range air-to-air refueling and C4ISR capabilities to support expeditionary operations. The ongoing People's Liberation Army Navy (PLAN) effort to develop an aircraft carrier will also aid China in realizing these goals.

China's Global Presence

As an emerging power, China's global presence and engagement have increased significantly over the past two decades, a fact with significant political, economic and military ramifications for the international environment.

Politically, China has moved from a state operating somewhat outside the international system to a full and active participant in global institutions and a generally constructive player. Rarely, though, and only with reluctance, will China accept the mantle of leadership on the global stage. China's foreign policy goals, like those of all countries, remain designed to further its national interests, but Beijing has become more willing to make some sacrifices in order to cast itself as a responsible international actor.

With the world's third-largest economy, China's influence on the global economy is enormous. China has some level of economic engagement with virtually every country in the world. Additionally, China was able to avoid the worst of the recent global financial crisis and emerged from it with even greater economic power than before. Beijing is also claiming a bigger voice in global economic forums, such as the Group of 20, and its influence will only grow as China's economy continues to expand. China's increasing need to import raw materials, especially oil, is driving much of its economic engagement with foreign countries and is affecting prices and product availability worldwide. Beijing's efforts to expand its influence in Africa, South America and the Middle East are due in large part to the need to maintain access to markets and resources. As the key sea lane of commerce, the significance of the Strait of Malacca, for example, has commensurately increased.

On the military front, the frequency and scope of People's Liberation Army (PLA) interactions with foreign militaries have expanded since 2002 as well. Through global military engagement, China

seeks to enhance its power by cultivating foreign relationships, bolstering its international image and assuaging the concerns of countries wary of China's rise. The PLA sends more than 100 delegations a year abroad and maintains a regular presence with approximately 100 countries. Their participation in bilateral and multilateral exercises and operations is increasing as well. The PLA currently contributes troops to 18 United Nations peacekeeping operations, and its involvement with international humanitarian and disaster relief efforts, such as Haiti, is growing. The PLAN is maintaining a three-ship contingent off the Horn of Africa to help combat piracy as well. China's burgeoning indigenous defense industry allows Beijing to generate revenue and enhance foreign relationships via arms sales. While the overall trend for the past 30 years has seen a decline in the use of arms sales as a tool for PRC influence, as the quality of PRC products and technologies improves, we may see these trends reverse.

Conclusion

The US Air Force continues to seek opportunities to develop and strengthen partnerships around the world, and to enhance our long-term capabilities through security cooperation. We continue working to further relationships with more established allies through programs such as the Joint Strike Fighter, where our partners have committed \$4.5B in research and development funding. We are helping to address a chronic shortage of strategic and inter-theater airlift among partner nations and we are developing our Contingency Response Groups, which are a key component of AF support to humanitarian assistance missions such as U.S Pacific Command's PACIFIC ANGEL program. Additionally, we continue to foster partner engagement capability; Australia's commitment to fund a communications satellite in the WGS constellation is another example of the value and synergy of lasting partnerships.

The USAF's aims for our Pacific forward presence in Guam are to strengthen and further develop our Asia-Pacific alliances and partnerships to advance mutual security interests, ensure sustainable peace and security in the region, and promote allied and partner contributions to global stability. We accomplish this by maintaining a robust persistent presence of rotational bomber, fighter and tanker aircraft enabling us to maximize opportunities to train with our partners. By modernizing our infrastructure we seek to guarantee Guam's viability well into the future. This continuous forward presence also serves as reassurance to our allies and partners in the region of America's commitment to their security, while also encouraging their enhanced security roles and facilitating regular multilateral security cooperation within the region.

In the Global Partnership Strategy, the Air Force has outlined a path to cultivate these key partnerships, nurture our global relations, and fortify our geographic access, safety and security around the world. Our strategy seeks to develop partners that are able to defend their respective territories while ensuring the development of interoperability and integration necessary for coalition operations. With more than 45,000 US Airmen assigned to PACAF/PACOM and an average of more than 2,000 deployed worldwide (to and from PACOM) every day, the Air Force remains fully engaged in this region.

Again, thank you for the opportunity to testify today on these important issues. I look forward to your questions.

HEARING CO-CHAIR BLUMENTHAL: Thank you very much for your comprehensive testimony.

I should have said beforehand let's try to keep the comments to seven minutes. Ms. Saunders, now that I let Mr. Lemkin speak comprehensively, I'll let you do the same. Next panel we'll just be

stricter.

**STATEMENT OF MS. MARY H. SAUNDERS
DEPUTY ASSISTANT SECRETARY OF COMMERCE FOR
MANUFACTURING AND SERVICES, U.S. DEPARTMENT OF
COMMERCE, WASHINGTON, DC**

MS. SAUNDERS: Thank you very much. I can speak very quickly, if you like. Vice Chairman Bartholomew and distinguished members of the Commission, thank you very much for inviting me here today to discuss the relationship between the United States and China in commercial aerospace manufacturing.

I am the Principal Deputy Assistant Secretary for the Office of Manufacturing and Services in the International Trade Administration. Manufacturing and Services provides specialized industry expertise and economic analysis to foster America's economic competitiveness and job growth.

The aerospace industry has long been one of the United States most competitive manufacturing industries. In 2009, U.S. aerospace exports were over \$81 billion, giving aerospace the largest positive trade balance of any sector. Maintaining the long-term competitiveness of this industry, which employs more than 478,000 Americans, is therefore a priority for us at the Department.

China is a very important market for U.S. aerospace exporters, and it presents a number of opportunities to expand U.S. exports and jobs in the United States. However, U.S. aerospace companies also face a number of challenges, many of which are shared by firms in other sectors.

My testimony today will highlight some of these opportunities and challenges and also serve to answer the questions that were posed by the Commission. I'm focusing mostly on the market for commercial aircraft. China is widely expected to be one of the largest markets for commercial passenger aircraft in the next 20 years. Growth in the Chinese fleet is being driven by annual double digit growth in both passenger and cargo volume.

Both Boeing and Airbus are predicting that approximately 3,800 more aircraft will be delivered to Chinese airlines by 2030. Based on list prices, the value for these aircraft would total over \$400 billion. A majority of those aircraft will be in the narrow body market including aircraft such as the Boeing 737 and the Chinese C919, which is currently in development.

Today, the Chinese large civil aircraft market is roughly divided between Boeing and Airbus. ITA does not engage in forecasting, but in the near term, we do not anticipate any radical changes in the distribution, although we note that Airbus has been gaining market share in recent years.

In the longer-term, the entry into the market of new competitors, including the C919, makes it more difficult to predict what the market share distribution will be. Since the United States is the only current producer of large civil aircraft outside of Europe, U.S. companies throughout the aerospace supply chain are well positioned to capitalize on this growth, expanding U.S. exports and jobs.

The growth in passenger and cargo service demand also creates opportunities for U.S. exports in related industries. China is currently building 42 new airports which will bring opportunities in construction, equipment sales and airport retail. More planes also means more pilots to be trained by U.S. flight schools and more opportunities to sell parts and maintenance services. In addition, improving transportation throughout China will provide greater physical access to the Chinese market for the broad spectrum of American exporters.

China is also a growing contributor to the global supply chain for aircraft and parts. Many U.S. and foreign aerospace firms have significant relationships with Chinese aerospace manufacturers, particularly in metal components. These relationships are not a recent development. U.S. companies have worked with Chinese suppliers for many years. While most of the interaction is on the component side, some Western firms, Airbus and Embraer, for example, have set up aircraft assembly facilities in China to provide commercial aircraft to the Chinese market.

China also manufactures fuselage sections for Bombardier's Q-400 turboprops and also is investing in the development of the C-Series passenger jet.

It is important to put the Chinese role in the U.S. aerospace supply chain into perspective. Historically, the U.S., as I mentioned earlier, has run a positive trade balance with China in aircraft and parts, amounting to about \$5.3 billion in exports in 2009. A significant portion of this figure is associated with new aircraft sales.

On the supply side, in 2009, China shipped approximately \$470 million worth of aircraft parts and equipment to the United States, representing just 2.12, a little over two percent, of U.S. aerospace parts imports by value. They trail far behind countries such as France with a little over 20 percent, the UK, close to 17 percent, Japan, 15 percent, and Canada, 12.6 percent.

We, therefore, conclude that the development of China's aviation

sector has to date had a minimal effect on the U.S. commercial aviation industrial base and has been limited mostly to component manufacturing.

For national security reasons, the United States has been unwilling to significantly advance China's state-of-the-art aircraft design, materials and production technologies since such technologies could be applied directly in their military aircraft developments.

As a result, subcontracted work has been limited to sheet metal fabrication, some hand lay-up of composite material and some low-tech aero gas turbine engine component manufacture.

U.S. companies are actively pursuing opportunities to become part of China's supply chain, as Chinese aerospace manufacturers develop their own commercial aircraft. China's aircraft manufacturing sector is decades old, but it's mostly been concentrated in military applications.

Since 1995, China has exported only \$2 billion worth of aircraft over a 15-year period. China has only one small passenger aircraft certified by the United States. The Chinese have been clear about their desire to gain Western certification of the ARJ-21 regional jet and the C919 narrow body so that it may be exported to Western markets, and China has actively sought participation of Western firms in the development of these aircraft, particularly in the development of major subsystems such as engines and avionics.

These programs present significant commercial opportunities for U.S. firms. The growth of the Chinese aerospace sector also presents inevitable challenges for U.S. companies and U.S. policymakers. These include concerns regarding the relationship between civil and military production, the direction of Chinese industrial policy in the aerospace sector, and the extent to which government funding in this sector could unfairly subsidize Chinese producers in violation of their WTO obligations.

Chinese aerospace firms, as you know, are state-owned enterprises that have historically been in commercial and military manufacturing both. U.S. export control regulations strictly restrict transactions of certain items that would directly and significantly contribute to China's military capabilities.

In 2008, China established the Commercial Aircraft Corporation of China, or COMAC, to focus on the commercial aircraft market. Other Chinese companies are involved in the commercial aircraft market as well.

The extent to which the creation of COMAC and other efforts to separate commercial from military work are effective remains to be seen. It's clear, however, that China intends to develop new capabilities through its commercial programs, some of which could then be used to

support its military program.

China has placed a high priority on developing a domestic capability in large aircraft manufacturing. Large passenger aircraft are listed as one of 16 key science and technology major special projects established in their National Medium and Long-Term Science and Technology Development Plan, which runs through 2020.

The plan also identifies enhancing indigenous innovation capability and aircraft as a major science and technology development path for the transportation sector. Developing a large passenger aircraft, the C919, is a priority project in China's 11th Five Year Plan.

Civil aircraft is one of 18 categories of major technology listed in China's December 2009 "Catalog Guiding Indigenous Innovation in Major Technology Equipment," which encourages domestic development of specific industrial equipment.

Since the establishment of COMAC in 2008, China has announced new programs in aircraft engines and in civil helicopters. In April of this year, China invested in Epic Aircraft, a bankrupt U.S. manufacturer of experimental general aviation aircraft, in a bid to enter that market.

While China encourages Western partners in aircraft manufacturing programs, foreign companies may not own Chinese aircraft manufacturers outright. They must rather form joint ventures in which the majority share is retained by the Chinese partner.

In addition, China has increasingly requested and required that joint ventures be established as a condition for awarding manufacturing contracts. These joint ventures typically involve some element of technology transfer by the U.S. partner.

In addition, while China does not have an official offset policy and made a specific commitment not to impose aircraft offsets as part of its WTO accession, a company's commitment to building a relationship with China is a factor in purchasing decisions.

U.S. export control regulations identify the items that require a license for export to China. When a license is required, the U.S. government evaluates the license application to assure that there are no national security risks associated with the transaction described in the application. Beyond that, U.S. firms must carefully weigh their competitiveness interests when determining how much proprietary technology they are prepared to share with prospective Chinese partners on these projects.

China's indigenous innovation practices for all industries are being closely scrutinized by ITA staff and the U.S. government. We've raised concerns about China's innovation policies through numerous meetings and letters and multilateral fora. During his trade mission this week and at next week's Strategic and Economic Dialogue, Secretary Locke has

and will continue to reiterate the concerns that we have with these policies.

Under Secretary Sanchez will also note our misgivings about these programs during next Wednesday's six month review of the progress of the Joint Commission on Commerce and Trade.

While these discussions are aimed at eliminating specific problematic aspects of China's indigenous innovation policies, it's clear that as a matter of industrial policy, China will continue to pursue the development of a domestically produced aircraft industry, capable of supplying the substantial internal demand and some foreign customers as well.

Briefly, on government funding, the C919 is primarily a government-funded project run by COMAC, a state-owned enterprise, which is jointly owned by the Chinese central government, the Shanghai municipal government and several large state-owned enterprises.

The Department of Commerce is clearly concerned with ensuring that government support for Chinese aerospace producers does not unfairly disadvantage U.S. companies and is fully consistent with China's WTO obligations. The structure of Chinese government financing and the relationship to its state-owned enterprises makes it difficult to make a clear determination regarding the nature of government support.

To better understand the nature and terms of government funding in China's aerospace and civil aircraft industry, the Department of Commerce is closely monitoring Chinese government involvement in the industry. Staff from the Subsidy Enforcement Office and the Beijing Office of the Import Administration, which is a unit of the International Trade Administration, are actively studying this issue.

In addition, as part of China's WTO Transitional Review Mechanism in 2009, the United States requested that China provide further details on its support policies in the aerospace sector. We've also followed up on the issue with questions in the WTO's China Trade Policy Review, which is currently being conducted.

If necessary, after sufficient information has been gathered and subject to interagency and domestic industry review, the United States can request additional information regarding China's subsidies to the aerospace and civil aircraft industry under Article 25.8 of the WTO Subsidies Agreement through the WTO Subsidies Committee.

It is our expectation that U.S. companies are and will be well positioned to sell aircraft and parts in China over the short to mid-term.

The United States has been the largest supplier to the Chinese aerospace market almost every year since 1995, and China has been a top ten market for U.S. aerospace exports since 1992.

Over the longer-term, the global competitive landscape becomes

more complicated. In addition to China's new C919, new aircraft programs that would compete with U.S. manufactured products have been launched or rumored in Canada and Brazil and in Russia. The potential for success in any of these programs is uncertain. At the International Trade Administration, we will continue to ensure that U.S. companies have the opportunity to compete on a level playing field so that the success of any program is based on the technical merits of the product rather than government intervention.

Thank you very much.

[The statement follows:]

**Prepared Statement of Ms. Mary H. Saunders
Deputy Assistant Secretary of Commerce For Manufacturing and
Services, U.S. Department of Commerce, Washington, DC**

Chairman Slane, Vice Chairwoman Bartholomew, and distinguished members of the Commission, thank you for inviting me here today to discuss the relationship between the United States and China in commercial aerospace manufacturing. I am Principal Deputy Assistant Secretary for the Office of Manufacturing and Services in the International Trade Administration. Manufacturing and Services provides specialized industry expertise and economic analysis to foster America's economic competitiveness and job growth.

The aerospace industry has long been one of America's most competitive manufacturing industries. In 2009, U.S. aerospace exports were over \$81 billion, giving aerospace the largest positive trade balance of any sector. Maintaining the long-term competitiveness of this industry—which employs more than 478,000 Americans—is therefore a priority for us.

China is an important market for U.S. aerospace exporters, and it presents a number of opportunities to expand U.S. exports and U.S. jobs. However, U.S. aerospace companies also face a number of challenges, many of which are shared by firms in other sectors. My testimony today will highlight some of these opportunities and challenges and also serve to answer the questions posed by the Commission. I will focus mostly on the market for commercial aircraft.

Outlook for American Sales

China is widely expected to be one of the largest markets for commercial passenger aircraft in the next 20 years. Growth in the Chinese fleet is being driven by annual double-digit growth in both passenger and cargo volume. Both Boeing and Airbus are predicting that approximately 3,800 more aircraft will be delivered to Chinese airlines by 2030. Based on list prices, the value for these aircraft would total over \$400 billion. A majority of those aircraft will be in the narrow body market, including aircraft such as the Boeing 737 and the Chinese C919, currently in development. Today, the Chinese large civil aircraft market is roughly divided between Boeing and Airbus. ITA does not engage in forecasting but, in the near term, we do not anticipate any radical changes in that distribution, though we note that Airbus has been gaining market share in recent years. In the longer term, the entry into the market of new competitors, including the C919, makes it more difficult to predict. Since the U.S. is the only current producer of large civil aircraft outside of Europe, U.S. companies throughout the aerospace supply chain are well-positioned to capitalize on this growth, expanding U.S. exports and jobs.

The growth in passenger and cargo service demand also creates opportunities for U.S. exports in related industries. China is currently building 42 new airports, which will bring opportunities in construction, equipment sales, and airport retail. More planes also means more pilots to be trained by U.S. flight schools and more opportunities to sell parts and maintenance services. In addition, improving

transportation throughout China will provide greater physical access to the Chinese market for the broad spectrum of American exporters.

Procurement from Chinese Suppliers

China is also a growing contributor to the global supply chain for aircraft and parts. Many U.S. and foreign aerospace firms have significant relationships with Chinese aerospace manufacturers, particularly in metal components. These relationships are not a recent development—U.S. companies have worked with Chinese suppliers for many years. While most of the interaction is on the component side, some western firms—Airbus and Embraer—have set up aircraft assembly facilities in China to provide commercial aircraft to the Chinese market. China also manufactures fuselage sections for Bombardier's Q-400 turboprops and is investing in the development of the C-Series passenger jet.

It is important to put the Chinese role in the U.S. aerospace supply chain into perspective. Historically, the U.S. has run a positive trade balance with China in aircraft and parts amounting to about \$5.3 billion in exports in 2009. A significant portion of this figure is associated with new aircraft sales. On the supply side, in 2009, China shipped approximately \$470 million worth of aircraft parts and equipment to the United States, representing just 2.12 percent of U.S. aerospace parts imports by value and trailing far behind countries such as France (20.2 percent), UK (16.9 percent), Japan (15.1 percent), and Canada (12.6 percent). We therefore conclude that the development of China's aviation sector has had a minimal effect on the U.S. commercial aviation industrial base, and has been limited mostly to component manufacturing.

For national security reasons, the U.S. has been unwilling to significantly advance China's state-of-the-art aircraft design, materials, and production technologies since such technologies could be applied directly to their military aircraft developments. As a result, subcontracted work has been limited to sheet metal fabrication, some hand lay-up of composite material, and some low-tech aero gas turbine engine component manufacture.

Participation in Chinese Aircraft Manufacturing Programs

U.S. companies are actively pursuing opportunities to become part of China's supply chain as Chinese aerospace manufacturers develop their own commercial aircraft. China's aircraft manufacturing industry is decades old, but it has mostly been concentrated in military applications. Since 1995, China has only exported \$2 billion worth of aircraft. China has only one small passenger aircraft certified in the United States. The Chinese have been clear about their desire to gain western certification of the ARJ21 regional jet and the C919 narrow body so that it may be exported to western markets. China has actively sought participation of western firms in the development of these aircraft, particularly in the development of major subsystems such as engines or avionics. These programs represent significant commercial opportunities for U.S. firms.

Challenges

The growth of the Chinese aerospace sector also presents inevitable challenges for U.S. companies and U.S. policy makers. These include concerns regarding the relationship between civil and military production; the direction of Chinese industrial policy in the aerospace sector; and the extent to which government funding in this sector could unfairly subsidize Chinese producers in violation of China's WTO obligations.

Military Manufacturing

Chinese aerospace firms are state-owned enterprises that have historically undertaken commercial and military manufacturing. U.S. export control regulations strictly restrict transactions of certain items that would directly and significantly contribute to China's military capabilities.

In 2008, China established the Commercial Aircraft Corporation of China Ltd. (COMAC) to focus on the commercial aircraft market. Other Chinese companies are involved in the commercial aircraft market, too. The extent to which the creation of COMAC, and other efforts to separate commercial from military work, are effective remains to be seen. It is clear, however, that China intends to develop new capabilities through its commercial programs, some of which could be then be used to support its military programs.

Industrial Policy

China has placed a high priority on developing a domestic capability in large aircraft manufacturing. Large passenger aircrafts are listed as one of 16 key science & technology major special projects established by the “*National Medium- and Long-Term Science and Technology Development Plan (2006-2020)*.” The plan also identifies enhancing indigenous innovation capability in aircraft as a major science and technology development path for the transportation sector. Developing a large passenger airplane (C919) is a priority project in China’s *11th Five-Year Plan (2006-2010)*. Civil aircraft is one of 18 categories of major technology equipment in China’s December 2009 “*Catalog Guiding Indigenous Innovation in Major Technology Equipment*”, which encourages domestic development of specified industrial equipment.

Since the establishment of COMAC in 2008, China has announced new programs in aircraft engines and civil helicopters. In April, 2010, China invested in Epic Aircraft, a bankrupt U.S. manufacturer of experimental general aviation aircraft, in a bid to enter that market. While China encourages western partners in its aircraft manufacturing programs, foreign companies may not own Chinese aircraft manufacturers outright but must rather form joint ventures in which the majority share is retained by the Chinese partner. In addition, China has increasingly required that joint ventures be established as a condition for awarding manufacturing contracts. These joint ventures typically involve some element of technology transfer by the U.S. partner. The intention seems to be for China to develop domestic capabilities in subsystems in addition to airframes. In addition, while China does not have an official offset policy, and made a specific commitment not to impose aircraft offsets as part of its WTO accession, a company’s “commitment” to building a relationship with China is a factor in purchasing decisions.

U.S. export control regulations identify the items that require a license for export to China. When a license is required, the U.S. government evaluates the license application to assure there are no national security risks associated with the transaction described in the application. Beyond that, U.S. firms must carefully weigh their competitiveness interests when determining how much proprietary technology they are prepared to share with prospective Chinese partners on these projects.

China’s indigenous innovation practices for all industries are being scrutinized by ITA staff and the U.S. Government. We have raised concerns about China’s innovation policies through numerous meetings, letters, and multilateral fora. During his trade mission this week and at next week’s Strategic & Economic Dialogue Secretary Locke has and will continue to reiterate the concerns we have with these policies. Under Secretary Sanchez will also note our misgivings about these programs during next Wednesday’s six month review of the progress of the Joint Commission on Commerce and Trade. While these discussions are aimed at eliminating specific problematic aspects of China’s indigenous innovation policies, it is clear that, as a matter of industrial policy, China will continue to pursue the development of a domestically produced aircraft industry capable of supplying internal demand and some foreign customers as well.

Government Funding

The C919 is primarily a government funded project run by, COMAC, a state-owned enterprise (SOE) jointly owned by the Chinese central government, the Shanghai municipal government and several large SOEs.

The Department of Commerce is clearly concerned with ensuring that government support for Chinese aerospace producers does not unfairly disadvantage U.S. companies and is fully consistent with China's WTO obligations. The structure of Chinese government financing and the relationship to State Owned Enterprises make it difficult to make a clear determination regarding the nature of government support. To better understand the nature and terms of government funding in China's aerospace and civil aircraft industry, the Department of Commerce is closely monitoring Chinese government involvement in the industry. Staff from the Subsidy Enforcement Office and the Beijing Office of the Import Administration are actively studying the issue. In addition, as part of China's WTO Transitional Review Mechanism in 2009, the United States requested that China provide further details on its support policies in the aerospace sector. We have also followed up on the issue with questions in the WTO's China Trade Policy Review currently being conducted. If necessary, after sufficient information has been gathered and subject to interagency and domestic industry review, the United States can request additional information regarding China's subsidies to the aerospace and civil aircraft industry under Article 25.8 of the WTO Subsidies Agreement through the WTO Subsidies Committee.

Global Competitiveness

It is our expectation that U.S. companies will be well-positioned to sell aircraft and parts in China over the short- to mid-term. The United States has been the largest supplier to the Chinese aerospace market almost every year since 1995, and China has been a top 10 market for U.S. aerospace exports since 1992.

Over the longer term, the global competitive landscape becomes more complicated. In addition to China's C919, new aircraft programs that would compete with U.S. manufactured products have been launched or rumored in Canada, Brazil, and Russia. The potential for success in any of these programs is uncertain. At the International Trade Administration, we will continue to ensure that U.S. companies have the opportunity to compete on a level playing field, so that the success of any program is based on the technical merits of the product rather than government intervention.

PANEL I: Discussion, Questions and Answers

HEARING CO-CHAIR BLUMENTHAL: Thank you, both. We have seven questions and 35 minutes, that means I'm going to be strict on keeping us all to the time. I'm going to bump myself up to the top though--the chairman's prerogative.

Mr. Lemkin, thank you very much for your testimony. It's not an indictment of your testimony--but the dichotomy between the first part and the second part. The first part is about trying to build a comprehensive and confident relationship with the Chinese, and the second part is basically all the capabilities the Chinese are building to undermine confidence in the region.

My question is this. We've heard testimony this year on the Chinese missile force capability and air force capability to essentially destroy every runway in Taiwan and destroy every shelter, as well as at

Kadena Air Force Base. We've heard testimony from RAND--you're probably familiar with the study--that about 75 percent of our own assets would be grounded at Kadena Air Force Base in a missile barrage, and we haven't done very much about just the basics of hardening and dispersal and passive defenses.

So my question is, it seems very much like the Chinese are doing all they can to undercut others' confidence. As much as we would like to see a relationship of confidence with the Chinese, the Chinese strategy seems to be to undercut others' confidence in our ability to defend them.

And I wonder a couple things. One is what are we doing to give our allies confidence that we will be able to operate in ways that--all we've seen I think in the last year is we've seen the decision not to go forward with the F-22.

We haven't seen very much decision, very many decisions, on programs that would continue to give us air supremacy that has undergirded stability in the region. We haven't gone forward with sales of F-16CDs or all the different suites of technologies and capabilities that would make them survivable. We just haven't seen very much in response, at least, to some of these capabilities you mention that are undercutting confidence in our capabilities.

So are we still committed to maintaining a favorable balance of power for us and our allies, which was always a canonical statement throughout the last 60 years or so? And what are we doing on the Air Force side to actually build a capability to maintain that balance for power, both for us and our allies?

Thanks.

MR. LEMKIN: And do we have the rest of the morning for me to answer that?

HEARING CO-CHAIR BLUMENTHAL: You've got about two-and-a-half minutes.

MR. LEMKIN: Okay. Commissioner Blumenthal, yes, a lot of questions within that one, as you know. As far as your point about the PRC's actions are undercutting the confidence, as a growing power in so many different dimensions, that's where we think they have a responsibility to engage with us and our partners, particularly in the region, but now globally, militarily, economically, politically.

We thought it was a positive thing that President Hu came for our President's Nuclear Summit in April, and he is supposed to come back for a State visit in June. Perhaps more progress will be made.

But let me talk about partners because you got right into the area that's my responsibility. I think our partners have a lot of confidence. You mentioned Kadena. Now I take a bit of an issue that it is not as

perhaps as drastic. We have done partial hardening. There are aspects of that that are classified that I can't get into.

There is a Patriot PAC-3 battalion that's been there for the last four years. Japan is engaged in a rigorous ballistic missile development, ballistic missile defense development program, and we are involved in that. Their joint air defense ground environment program, which brings everything together in that area, early warning radars, ground operations, PAC-3, Aegis missile defense, et cetera, we are cooperating with them, and that will provide them this integrated C4ISR overarching architecture that will be invaluable.

Okay. So what are we doing for our partners, as I said? You mentioned some other things. I could go around the region, talk about the relationship with Singapore. I'm very proud of what we've done in the seven years of my tenure in Singapore's F-15SG program, in the Strategic Framework Agreement with Singapore, and I was involved in that.

Australia, a joint strike fighter partner, committed to the joint strike fighter, the F-35.

In Japan, moving forward on their fighter program, and hopefully they will join us in the F-35.

In Korea, as we move forward into the OPCON shift in 2012, that's being done in a very productive way, and Korea's Air Forces are being modernized.

Meanwhile, we maintain our forward presence, including our very capable build-up in Guam. So I think the signs are very positive, our commitment of technology and forces not just for ourselves but for our partners in the region.

HEARING CO-CHAIR BLUMENTHAL: Thank you very much, Mr. Lemkin.

Commissioner Wortzel.

COMMISSIONER WORTZEL: Thank you both for your testimony.

Mr. Lemkin, I'm going to read you a little section out of Dr. Tai Ming Cheung's testimony that will come this afternoon:

"Chinese aircraft designers claim that they're capable of producing a platform that is as technologically sophisticated as the U.S. fifth generation F-22 and F-35 fighters that have stealth, super-cruise and active electronically scanned array radar."

The Commission's 2009 annual report discussed the loss of significant amounts of research and development data and electronics data on the joint strike fighter through cyber espionage, most likely to China.

Are you concerned that this may already have compromised any

capabilities of the F-35 and at the same time helped China's efforts to produce a sophisticated fifth generation fighter?

MR. LEMKIN: Thank you, Commissioner Wortzel, and, of course, good to see you again, sir.

There are lots of countries that say they're going to be a fifth generation fighter, and they produce pictures. It's not just China. It's really hard to do. It was hard for us to do. And AESA radar. We're still the only ones that have an operating AESA radar.

Have they gleaned things? Most probably. It will require our continued analysis, but when you look at all the characteristics of a fifth generation fighter, and I was pleased to see you actually listed them--most people don't really understand that it's not just about stealth--but if you look at inherent net centric capabilities, the sensor fusion, which is a very difficult thing to achieve, there are lots of things here that contribute to the force multiplying capabilities of let's say the joint strike fighter.

So this will be very difficult for anybody else to match. Will it happen eventually? Yes. I don't think that anybody knows when, and I would say ten years is pretty optimistic.

HEARING CO-CHAIR BLUMENTHAL: Thank you.

Commissioner Shea.

COMMISSIONER SHEA: Thank you both for being here. My question is for Mr. Lemkin. You mentioned in your testimony how the United States remains committed to assisting Japan and Korea in promoting regional stability.

It's my understanding that since 1998, the U.S. Congress has effectively prohibited the sale of F-22s to any foreign government, and it's also my understanding that Japan at one point expressed an interest in purchasing F-22s. I was wondering does the administration have a position on lifting the ban on the sale of F-22s to regional allies?

And if not, if you could just outline in your own mind what are the pros of doing that and what are the cons of doing that?

MR. LEMKIN: Well, as you know, the Obey Amendment specifically prohibited the export of F-22, and we responded to the Congress just recently on some studies on how would the F-22 be made exportable? The F-22 was not designed to be exported, and that is probably the principal piece that makes it very, very difficult to do so.

There's another part, and that is that the decision was made to terminate production at 187 aircraft. So by the time you were able to even produce something, that was going to cost a great deal of money, and who's going to pay for that, you've got an aircraft that's out of production.

The real answer is the F-35, the joint strike fighter, which despite

some of the press and the publicity is progressing very well. We are committed to it. It is tremendously capable, and we want to see as many of our not eight original partners, just the eight original partners, but as many of our partners in a larger sense operate that aircraft because it will give us the combat edge. It will also be the centerpiece of Air Force-to-Air Force relationships and interoperability that will promote coalition operations, and we know those kinds of capabilities are really the key to deterrence.

COMMISSIONER SHEA: Thank you.

HEARING CO-CHAIR BLUMENTHAL: Done?

COMMISSIONER SHEA: Well, can I have another follow-up question?

HEARING CO-CHAIR BLUMENTHAL: You have another two minutes.

COMMISSIONER SHEA: Okay. Again for Mr. Lemkin. Do you agree that the fighter capability of the Taiwan Air Force is likely to decline over the next five years significantly, and in light of our obligations to provide Taiwan with self-defense capability, I'm wondering what's going on in the administration on the F-16 sales?

MR. LEMKIN: I've been to Taiwan twice in this job, and you know I'm the senior U.S. official that can go, and I'm very familiar with their capabilities and their facilities. And I think your statement, over the next five years, will their fighter capabilities decline, I think everybody is in agreement because their 145 F-16s, for example, are getting older, and their capabilities are not keeping up, let's say, plus their indigenous fighters, et cetera.

Now, the decision on a new acquisition of F-16s and/or updating the 145 is still under review, but I think it's important to recognize that it's not just about fighters. This is all about the integrated capabilities.

Taiwan is achieving the capability of what we call the surveillance radar program. It is a one-of-a-kind radar in the world, both anti-missile, anti-air, and surface defense capabilities. It will be fully integrated with their Patriot system.

So, in terms of defensive capabilities, you just can't talk about fighters. All this is being analyzed and reviewed such that the right decision can be made by the administration.

COMMISSIONER SHEA: Thank you.

HEARING CO-CHAIR BLUMENTHAL: Okay. Commissioner Wessel.

COMMISSIONER WESSEL: Thank you both for being here.

Because of the limited time, I hope that you'll both entertain questions in writing after that we might be able to submit and get some responses later on some of the issues that we may not get to today.

Ms. Saunders, I turn to you now for a moment, and I apologize, but I'm somewhat troubled by your testimony. In the theory of international trade, one should rely on comparative advantage. That's what we're always told. China next week will ask, again, at the S&ED talks, to be treated as a market economy, something that it's tried several times in the past.

You indicated as part of your testimony that China is going to be subsidizing, as it has with ARJ-21, the C919 platform, and there are expectations that those subsidies could rise to the level of potentially 20 or more billion dollars. We ask questions within the Transitional Review Mechanism, et cetera. Why shouldn't we expect that Boeing, Airbus and other strong competitors be given the opportunity to sell into the Chinese market and have that advantage rather than through the indigenous innovation policies and the five-year plans that China continually develop through subsidies, through non-market efforts, their industry?

We make competitive aircraft that's bought all over the world. Why shouldn't we have the ability to do that and that China's efforts to develop its own industry be abated?

MS. SAUNDERS: A couple of points. Thank you for the question. I said that U.S. Department of Commerce is concerned that ensuring government support for Chinese aerospace's manufacturers does not unfairly disadvantage U.S. companies.

It is difficult to unwind the structure of Chinese government financing and the relationship of the state-owned enterprises. So we certainly continue to investigate that. There is, we have a staff from the Import Administration on the ground at the Embassy in Beijing that look at this, at these sorts of issues. The Import Administration applies U.S. trade laws, and if requested by China will again make a determination regarding whether China is a market economy or not. That has to be a specific request, and as you know, there are detailed criteria in the law which the Import Administration has to consider.

So we are closely monitoring Chinese government involvement in the industry. We have not--I don't have a definitive answer as to whether there is subsidization, how much subsidization, what the relationships are in large part because China is not a market economy.

I will say that China continues to be a major export market for U.S. aerospace manufacturers. We are monitoring the issue very closely, as I said, the issue of subsidization. We also work through the Joint Commission on Commerce and Trade through the Strategic and Economic Dialogue. We are looking very closely at the situation in China to make sure that we maintain a fair export market and a level playing field for U.S. companies.

COMMISSIONER WESSEL: I understand there is some policy dyslexia, shall we say, right now because of the U.S.-EU issues relating to subsidies and the WTO report. Have we reached out to any of our competitors like Airbus or other nations that are making competitive aircraft to join in an effort to make sure that China's activities are only market driven and not based on the subsidies and preferential policies that have existed in a lot of other areas?

MS. SAUNDERS: I can't speak to the details of that. I perhaps could get you a comprehensive answer to that in writing following the testimony.

COMMISSIONER WESSEL: Okay. Where does the U.S. see the U.S. aircraft industry? You had talked about I believe it was 478,000 employees that we presently have. What are we doing to enhance our ability to compete? USFCS and ExIm and OPIC and all the various other programs we know about. We have faced in some areas, that at least with the ARJ-21 and now the C919, that U.S. co-production, offsets, agreements, et cetera, have enhanced Chinese platform integration capabilities.

Are we now having discussions with our companies to talk about where those programs should go in the future so that we don't advance a competitor's interests unduly?

MS. SAUNDERS: We have certainly conversations with the Trade Association, with the individual companies who come in frequently to meet with various officials at the Commerce Department. We also have an Industry Trade Advisory Committee on the aerospace sector which meets regularly and discusses these issues. So we have several sources of information and exchange with the industry to look at specifically the issues that you mentioned.

COMMISSIONER WESSEL: Thank you.

HEARING CO-CHAIR BLUMENTHAL: "Policy dyslexia." I like that term. Does that mean we write policy backwards or upside down or something? It's a term I'm going to use.

COMMISSIONER WESSEL: It depends on which way you look at it.

HEARING CO-CHAIR BLUMENTHAL: Commissioner Fiedler.

COMMISSIONER FIEDLER: Thank you.

Mr. Lemkin, sort of judgmental question, although it's somewhat fact-based, all of the facts of which you probably can't discuss so I'll ask it on a judgmental level. Did we underestimate the rapidity with which Chinese air capabilities advanced over the last 15 years, 20 years?

MR. LEMKIN: I don't think I can answer that question. I can get you a written response, but as you said, it would be purely judgmental. I don't think this is, I don't think it's unexpected. But you cannot look

at their military capability in isolation from their economic and industrial development, the relationship that they had with--and the larger relationship with Russia and the technologies that they acquired, and that they then started to produce indigenously. If you would like more of a facts-based evaluation, then I can provide that in writing.

COMMISSIONER FIEDLER: No. I think that's fair. The linkage is certainly fair. What I'm trying to get at is, and if I would sort of pose my next question based on your answer, which is nobody thought they would advance as rapidly economically and militarily as they have. I don't think anybody really seriously thought everything--I mean predicted it exactly.

But that inability of us--no blame attached--that inability to project reasonably accurately, has a policy impact and a procurement impact when we're trying to figure out our deterrence capabilities, i.e., the Chinese certainly couldn't best us head-to-head so they chose to do anti-access/anti-denial capabilities where we have to react to that.

Are we up to speed on that? Are we behind on that? And that goes to my earlier question of if we didn't expect it, we were certainly behind on it?

The reference to Mr. Blumenthal's answer about hardening, we've done partial hardening, but so it seems to me as if we were playing catch-up vis-à-vis the Chinese military capabilities over the last 15 years. And if we are, how do we not do that again?

MR. LEMKIN: Quite frankly, I first went to China 13 years ago and as a Navy submarine captain, skipper of two nuclear submarines, so that was my frame of reference. I certainly have not been surprised by Chinese military developments; I don't think many of us are.

Frankly, I think many of us are surprised they are not more advanced. Now, there are certainly areas that have developed. For example, in the cyber area, et cetera, and space capabilities, and I'm not in a position to assess if we, if they were more advanced or less advanced than we thought they would be.

I will say that this is a subject of continual analysis, and our capabilities that are defined by the--it's certainly an acquisition by the President's budget request, reflects all of those analyses.

I get back to what I said earlier, that while we have extraordinary capabilities, the reality is that we need friends and partners with appropriate capabilities to reinforce stability and security in the region.

COMMISSIONER FIEDLER: Let me rephrase the question more simply. Can we overcome ourselves, without partners, friends and allies, Chinese anti-access capabilities today?

MR. LEMKIN: I don't think I'm the right person to answer that. My own opinion is yes, but I would ask the Commander of the U.S.

Pacific Command. That's his job.

COMMISSIONER FIEDLER: Thank you.

HEARING CO-CHAIR BLUMENTHAL: Thank you.

Commissioner Videnieks.

HEARING CO-CHAIR VIDENIEKS: Videnieks.

Mr. Lemkin, in your testimony I have not heard you mention the inability of the Chinese to build engines. I understand the C919 is getting a GE engine supplied to them commercially--and also air refueling capabilities apparently are nonexistent. Are they leapfrogging our Industrial Revolution by basically saying, okay, we have ballistic missiles, we target carrier groups, and those kind of things?

As far as you can say, are they planning to overcome these hurdles? Or are they basically going to forget about them and go to missiles?

I have a question for Ms. Saunders also.

MR. LEMKIN: Thank you, Commissioner.

I don't think they're forgetting anything. I think you hit the nail on the head when you said that because they lack certain capabilities, they have reinforced the capability that they have, and that's in the area of ballistic missiles, et cetera.

Will they develop, further develop other capabilities? I think it's inevitable. So as I said in my testimony, it's something we have to continue to analyze, and we have to do what is necessary to ensure that we maintain a force that can prevail such that it provides deterrence because that's what deterrence is all about.

Simultaneously, we need to work to develop a strong competent military-to-military relationship. That has to be two way and has got to be based on greater transparency on the part of the Chinese.

HEARING CO-CHAIR VIDENIEKS: Thank you.

Ms. Saunders, what is the trend in aerospace manufacturing employment? You mentioned half a billion number, which is probably a fairly small percentage of overall U.S. employment. Are we projecting an increase in that area in the short run? What's the picture in the long run in light of what's happening, tech transfer and so forth, and the price of doing business, selling to China?

MS. SAUNDERS: Okay. Thank you for that question.

Department of Commerce's specialty is predicting or looking at the competitiveness of the industry sectors. Directly for labor data would come from the Department of Labor.

But let me say specifically about the aerospace sector, the employment numbers are significant; they are important. There are many, many suppliers to Boeing, for example, in the U.S. market so the employment is broadly spread throughout the economy, throughout the

regions of the economy as well as different sectors that support the aerospace sector, and with the growing markets overseas, China is one example, a very significant domestic demand for aircraft over the next ten to 20 years, and there are other growing markets as well.

We have a very competitive manufacturer so our expectation is that the employment numbers will hold, particularly now with the fact that the 787 is now being delivered. The employment numbers will hold and could expand as the economy recovers.

HEARING CO-CHAIR VIDENIEKS: Thank you.

HEARING CO-CHAIR BLUMENTHAL: Vice Chairwoman Bartholomew.

VICE CHAIR BARTHOLOMEW: Thanks very much and thank you to both of our witnesses for appearing here today and for the many years of service that you have put in to our government. Thank you. I think everybody is very appreciative of that.

You both raise very compelling sets of issues and very different ones. I feel a little bad that, Ms. Saunders, that we keep asking Mr. Lemkin the questions. You might not feel that way.

HEARING CO-CHAIR BLUMENTHAL: She doesn't.

MS. SAUNDERS: That's okay.

VICE CHAIR BARTHOLOMEW: But I'm going to continue that path right now, and if I have time, I have one for you also. But Mr. Lemkin, you just raised the issue of mil-to-mil contacts, and I'd like to know what specific benefits the U.S. has gotten out of previous mil-to-mil engagement between the PLA Air Force and the U.S. Air Force? That's the first piece.

And then the second is, if China resumes military contacts with the U.S., what are the U.S. Air Force's priorities for such contacts?

MR. LEMKIN: Thank you, ma'am. I join you in wishing more questions had gone to my colleague.

We have gained, I think, more mutual confidence in the engagement that we have had. Unfortunately, it's been on again/off again. When we have a commander of U.S. Pacific Air Forces go to China and fly in one of their fighters, when he gets to go talk to their leaders in the field, and you have a very frank and mutual conversation, that is helpful in that area of understanding and confidence building. That's what the whole Military Maritime Consultative Agreement was all about.

Our goal, we would very much like to have a meeting with, a counterpart visit with the PLA Air Chief and the Chief of Staff of the U.S. Air Force. We would like China to do that because-- and I've done this for a long time--seven years--and been involved in a lot of counterpart visits-- there is nothing that compares when you have the

chiefs of the Air Force that come together, sit and talk about, and they determine that they have much more in common than they have that's different, and common goals, and how we do things.

It gets rid of a lot of the myth and superstition, and I have found in over 40 years of government service, and most of it associated with the military, that oftentimes these people that are warriors, when you get them together, they can have better relationships, establish more understanding, than many others because they have lot more in common.

So I think this is very important to the security of the United States, very important to China's future, and of course in the region, and because of the growing role of China, the world.

VICE CHAIR BARTHOLOMEW: There's concern, among some of us--I've had it for a number of years--about mil-to-mil engagement, that while confidence is important, we gain confidence, but the Chinese gain knowledge and they gain capability. Are we getting as much out of these exchanges as they are?

MR. LEMKIN: Well, ma'am, that's exactly my point on transparency. We are insisting on increased transparency. This has got to be reciprocal. And so China--and that's our point-- China needs to see this as mutually beneficial, and they have to be willing to show us more, discuss more, but we have made progress.

When I told you that the Commander of the Pacific Air Force, our four-star commander, flew in the back seat of one of their most modern fighters, that was a great step in that direction. Of course, then, shortly after that, we had another cutoff in mil-to-mil engagement on the part of China so it's not productive when these things happen. It is in the interest of both nations for this to proceed.

VICE CHAIR BARTHOLOMEW: Could you explain, though, because I struggle with this, this dynamic, that when the Chinese government gets upset with the United States about something, one, anything, one of the first things it does is cuts off the military-to-military engagement, and then somehow it seems that we're in a position of going panting after them in order to resume the mil-to-mil engagement. There's an asymmetry there. Why?

MR. LEMKIN: I don't really agree with the latter part of your statement that we're in pursuit. I happened to be in the enviable position of being the U.S. official to first have to deal with this latest issue over Taiwan arms sales with the media when I was at the Singapore Air Show and did an interview on CNBC Asia Squawk Box among other places.

And my point there was this is ridiculous for them to cut off these relationships. This is in their interests as well, and it gets to not just the mil-to-mil but the commercial relationship. Stability, perception of

stability, and confidence is not just between our countries, it's between all the countries in the region, and as I said, increasingly in the world. And it doesn't help China's economic development. It doesn't help any of us when they do this. It's not just the mil-to-mil piece.

So when you look at what we do in carrying out our stated obligations under the Taiwan Relations Act, to go react that way, we just kind of scratch our heads and go this doesn't make sense. Now why don't we get on with the kind of dialogue that is productive.

VICE CHAIR BARTHOLOMEW: Thank you.

HEARING CO-CHAIR BLUMENTHAL: Will you both indulge us in one more question? Five more minutes?

COMMISSIONER MULLOY: I haven't had my chance.

HEARING CO-CHAIR BLUMENTHAL: That's what I'm asking, Commissioner Mulloy.

VICE CHAIR BARTHOLOMEW: It's for you, Pat.

COMMISSIONER MULLOY: Thank you.

HEARING CO-CHAIR BLUMENTHAL: Yes. Okay. Commissioner Mulloy.

COMMISSIONER MULLOY: Thank you. Thank you both for being here, not only for your oral testimony but your very thoughtful written testimony. Both of you put a lot of time and effort into it.

I was reading the testimony of Peder Andersen from the International Trade Commission, and my question will really be directed to you, Ms. Saunders.

Mr. Anderson says on page 2 of his testimony, quote, "China has a national strategy for the development of its aircraft and parts manufacturing industry."

Then on page five and six of his testimony, he talks about part of the national strategy is to encourage foreign companies in order to get market access to move manufacturing technology and know-how to China. They have a vision. They want it. They have a national strategy. They want an aerospace industry, and they're incentivizing American corporations and other foreign corporations to help them develop that industry.

Ms. Saunders, you talk about this same issue on page six of your testimony. You talk about that they require the companies go into joint ventures, that they require the companies to transfer technology as a part of awarding contracts in China, and then you say something very interesting, and I'll quote it.

You say-- "China does not have an official offset policy." In fact, it made a specific commitment not to have one when they joined the WTO, but you say a company's commitment to building and you put "commitment" in quotation marks to draw our attention to that--to

building a relationship with China is a factor in purchasing decisions.

And here's what I read from that. The company in pursuit of its quarterly profits wants-- and the Chinese say help us develop our industry, and you'll get market access here, and the Chinese say you got to show us you're committed to our development as a part of getting market access here. That's the Chinese government. And the companies then will make the decisions on what they want to transfer in terms of building China's aerospace industry.

What is the U.S. government policy and what do we tell our corporations? Do we want them to do this? Or do we think that it's good for the country for them to be doing this?

I just add one more thing. Mr. McGregor, who was the former head of the U.S. Chamber of Commerce in China, wrote a very interesting article in the Washington Post yesterday, "The Red Flags Over China's Trade Policies," where he talks about this, that these are really very problematic for the United States because China has a strategy, the American companies are looking for quarterly profits, and we are not asking our companies, in other words, we have no government policy to deal with this type of problem.

So I ask you both, do you think this is a problem and that our government needs to develop more policies to help our corporations think about what we're doing in China?

MS. SAUNDERS: Well, Commissioner Mulloy, China is a very large market, lots of opportunities. It's also a very complicated market, and, as was noted earlier, it's not a market economy. China has acceded to the WTO, and the Department of Commerce, the trade agency's job is to make sure that China adheres to its WTO commitments and also to encourage it strongly to expand its WTO commitments.

As you noted, it did make a specific commitment not to impose aircraft offsets as part of its WTO accession. It did not join the Agreement on Civil Aircraft, however. That's an important issue that we continue to press with China.

So it's our job to make sure that exporters are well informed about what their rights are under the WTO and what they can expect China to adhere to, to make sure that they are educated before they enter the Chinese market, and as they go about operating in the Chinese market, and beyond that, individual firms make commercial decisions based on their internal calculations, and the U.S. government does not get into, get into deciding what those decisions should be or providing input to private commercial decisions.

It's our job to establish the framework, to make sure that China is adhering to those WTO commitments, to try to expand them, to make sure that exporters are aware of what their rights are, as well as their

responsibilities, and we certainly do not encourage particular actions by companies but make sure that they know what their rights are.

COMMISSIONER MULLOY: Mr. Lemkin, do you think that's a wise policy in terms of U.S. national security interests and the growth of China's aerospace power?

MR. LEMKIN: I certainly defer to my colleague, Ms. Saunders, but let me just tell you from my perspective in building these partnerships around the world and in my role as a senior Air Force official, there is no doubt that a robust U.S. industrial base is absolutely critical to the security of our nation.

It's also very clear that we cannot operate our industrial base in isolation from the rest of the world. There are raw materials. There are other things that we need to be able to build the finest aircraft and systems in a world.

There's another piece of this. We want to be able to continue to have our friends and partners acquire the same systems that we operate. Why is that? It's not just about selling airplanes. It is the foundation for interoperability, and interoperability has lots of dimensions--establishing stronger relationships by training together, operating together, flying together.

What that translates to in an Air Force, from an Air Force perspective is, if it is appropriate, we can fly and fight together seamlessly as one. None of these things are discrete. So we have to have the ability to continue to build the kinds of capabilities that will ensure our security.

COMMISSIONER MULLOY: Thank you.

HEARING CO-CHAIR BLUMENTHAL: I want to thank you both very much, very much for a great panel. I think we really learned a lot, and I thank you for your candid answers as well as your great testimony. So thank you very much for coming out.

We're going to take a five minute break, and reconvene at 10:40.

[Whereupon, a short recess was taken.]

PANEL II: DEVELOPMENTS IN CHINA'S MILITARY AEROSPACE CAPABILITIES

HEARING CO-CHAIR BLUMENTHAL: We are going to start the panel so the panelists scurry to their seats.

COMMISSIONER WESSEL: Scurry?

HEARING CO-CHAIR BLUMENTHAL: Scurry.

COMMISSIONER FIEDLER: As if a ballistic missile was coming their way.

HEARING CO-CHAIR BLUMENTHAL: That's right. Our last

panel before lunch will examine China's aerospace capabilities in the military sector. We're joined by three prominent experts to explore this topic.

Our first speaker, Dr. Roger Cliff, is a senior political scientist at RAND where he specializes in security issues involving China. He's one of the leading analysts of this topic. He does research on air force doctrine, anti-access strategies and aerospace industry. He has a Ph.D. in International Relations from Princeton University.

Our next speaker, Mark Stokes, is the Executive Director of Project 2049 Institute, a think tank that focuses on future security assessments of East Asia. He formerly was a 20-year U.S. Air Force veteran, and served as Team Chief and Senior Country Director for China, Taiwan, Mongolia in the Office of the Assistant Secretary of Defense for International Security Affairs.

Our final speaker on the panel is Wayne Ulman, the China Issue Manager at the National Air and Space Intelligence Center at Wright Patterson Air Force Base in Ohio.

In that capacity, he is the organization's senior representative on China issues and provides oversight for overall China analytic efforts. He has a long experience covering China and is very well known in the field.

I'll ask the panelists, if they could, to look at that little clock over there and try to stick to seven minutes for each of your presentations. I'm sure there will be a lot of questions afterwards.

So with that, Dr. Cliff, if you want to begin.

**STATEMENT OF DR. ROGER CLIFF
SENIOR POLITICAL SCIENTIST, THE RAND CORPORATION
ARLINGTON, VIRGINIA**

DR. CLIFF: I'd like to start off by thanking you, Commissioner Blumenthal, as well as the rest of the Commission for giving me this opportunity to testify. I should start out with the standard disclaimer that although what I'm about to say is to a large extent based on research that I've done at RAND, my prepared testimony, both my written and my oral comments, are specifically for this briefing, and so what I say will represent my own opinions and not those of RAND or any of its sponsors.

The topic I'm going to talk about is the development of China's air forces over the past decade or so. A two sentence summary of that is that China's air forces have made substantial strides over the past decade and are well on their way to becoming a fully modern air force. By fully modern, I mean something that looks like the U.S. or European

air forces, say in the 1990s, but they're not there yet and they're still in that process.

Nonetheless, as my colleague Jeff Hagen will talk about in more detail this afternoon, given China's geographical advantages, China's air forces do have the potential to present significant challenges to the U.S., particularly in the most likely conflict scenario between the U.S. and China, which would be a war over Taiwan.

And, finally, before I dive further into my testimony, let me just say what I'm talking about when I talk about China's air forces. I'm going to limit my remarks to the People's Liberation Army Air Force, which is their counterpart to the U.S. Air Force, and the fixed wing aircraft of the People's Liberation Army Navy.

So I won't talk about the helicopter forces that are operated by the PLA Army or about the helicopter forces of the PLA Navy. Furthermore, the PLA Air Force, unlike the U.S. Air Force, operates not just fixed wing aircraft or not just aircraft, but also long-range surface-to-air missiles and anti-aircraft artillery, and it has airborne forces.

That is not just the airlift that's used to carry the paratroops but the actual paratroops themselves. In fact, there are three divisions of them within the PLA Air Force.

If you go back and look at China's air forces around 2000, you would have seen about 3,200 fighters, 150 medium bombers, a fairly large force, especially on the fighter side of things, but virtually all of those fighters were based on the MiG-19 and MiG-21 aircraft which first flew in the 1950s. Almost all these aircraft did not have beyond-visual range missiles. They had no aerial refueling capability. The bombers and strike aircraft that China's air forces operated had no precision-guided munitions other than torpedoes and anti-ship cruise missiles, and of course they had no stealth capabilities.

The surface-to-air missiles, the long-range ones, were based on the Soviet SA-2, again, a system which first entered service in the 1950s. The training of China's air forces was poor. The number of flight hours that pilots received was basically enough to maintain basic flying proficiency. Exercises were scripted with predetermined outcomes. The officer corps was not very highly educated. Almost all were either graduates of the PLA's military academies or else were direct promotions from the enlisted ranks without ever having had received a college education.

Today, the picture is very different. First of all, one of the most dramatic changes is the downsizing of China's air forces, particularly the PLA Air Force, which cut 100,000 personnel, a quarter of its end strength, over the past decade. The total number of fighters in the combined inventories of the PLA Air Force and PLA Navy has fallen by

about half from about 3,200 to about 1,600, and about a quarter of those aircraft are now so-called "fourth generation" aircraft.

Many of the fighters in China's inventory are now beyond visual range capable. They have about a dozen airborne early-warning aircraft.

The fighters and bombers carry a range of precision-guided munitions, and the majority and arguably the greatest degree of modernization has actually occurred in China's surface-to-air missile forces where now the majority of the surface-to-air missiles that they operate are based on the Russian SA-10 and SA-20 system.

The training of all the forces has improved, both in terms of the number of flight hours that pilots receive, which in the cases of the most modern aircraft are considered to be comparable to those of their Western counterparts.

Exercises are more realistic. They're conducted in unfamiliar airspace, at night occasionally, over water occasionally, and so on. The officer corps is better educated. A half of all officers entering the PLA today are actually graduates of China's civilian universities, which are considered superior to its military academies, both in terms of the quality of students they get and also in terms of the education that they provide.

Nonetheless, there are a lot of shortcomings still in China's air forces. Two-thirds of its fighters are still-based on the MiG-19 and MiG-21. Many are still not capable of beyond-visual range engagements or carrying precision-guided munitions. They still have no stealthy aircraft, no long range bombers. They have minimal area refueling and strategic airlift capabilities, and the training still falls well short of U.S. standards.

To summarize, and I see I have 54 seconds left, China's air forces are still in the process of modernization, and this is a process that will probably not be complete for another five or ten years.

Thank you.

[The statement follows]¹

HEARING CO-CHAIR BLUMENTHAL: Thank you very much, Dr. Cliff.

Mr. Stokes.

**STATEMENT OF MR. MARK STOKES, EXECUTIVE DIRECTOR
PROJECT 2049 INSTITUTE, ARLINGTON, VIRGINIA**

MR. STOKES: I appreciate the opportunity to come here and

¹ [Click here to read the prepared statement of Dr. Roger Cliff](#)

discuss one of my favorite topics, which is China's increasingly accurate and lethal conventional ballistic and land attack cruise missile force.

I'll discuss the aviation aspect of China's overall military modernization, but the real focus of my remarks will be on the other aspect of aerospace--China's evolving aerospace power.

One of the reasons why I'm so interested in their theater ballistic and land attack cruise missile program is that it's problematic. It's problematic in a number of ways.

Number one, operational. Ballistic missiles and land attack cruise missiles offer the PRC the means to be able to overcome adversary enemy air defenses. It's a mission that as of right now, the PLA Air Force is not able to conduct on their own, and I'll get into this a little bit more in detail.

But the PRC ballistic missile and land attack cruise missile force is problematic, and that's the first reason--operational.

The second reason is that the emphasis or the centrality that the PLA places on ballistic and land attack cruise missiles in terms of their overall strategy is that it dilutes international efforts to be able to control the proliferation of these technologies, control the proliferation of ballistic missiles and what should be controlled, the proliferation of land attack cruise missiles.

It sends the wrong signal that if the PRC is able to successfully, successfully rely upon ballistic missiles for its operational and political goals, then it provides an incentive for others to be able to adopt some of the same means.

The third reason is that it also encourages new strategic competitions. Ballistic missiles and land attack cruise missiles are inherently offensive, and the only way to really defend against them, it is possible to be able to intercept them in flight.

However, it is difficult, particularly given what the PRC is doing in terms of numbers and doctrine, how to apply the ballistic missiles.

The fourth reason is that it obstructs progress in cross-Strait dialogue. President Ma Ying-jeou of the Republic of China on Taiwan has set a precondition for removal of SRBMs, short range ballistic missiles, opposite Taiwan in order to be able to engage in substantive political dialogue that could come to some sort of resolution in a manner acceptable to the people on Taiwan.

And the fourth, and the last reason, is that it poses significant challenges to the viability of the Intermediate Range Nuclear Forces Treaty between the Soviet Union and the United States.

Russia has actually proposed or expressed a desire to be able to discuss the possible withdrawal from the INF Treaty, and this potentially could unravel one of the great successes dating back to the

Reagan administration.

So with that in mind in terms of some of the reasons why they're problematic, why is the PRC relying upon ballistic and land attack cruise missiles? Well, the first reason has to do with the relative shortcomings of the aviation industry. This does not mean that the aviation industry and the PLA Air Force are not modernizing. They are.

But in a relative sense, under a program where they've emphasized nuclear weapons and ballistic missiles and satellites, aviation industry in the past has not had this much emphasis as a space and missile industry.

When you say aerospace industry, of course, in China, they're neatly divided between aviation and space and missile. But it also offers an inexpensive means, a relatively inexpensive means, to be able to achieve their operational objectives. That's the second reason.

And then, finally, ballistic missiles have an inherent coercive sort of effect because it's so hard to defend against. In Taiwan, every citizen on Taiwan lives within seven minutes of destruction of ballistic missiles. There is some limited protection with the PAC-3 that they eventually will get, but still there's significant psychological coercive value to ballistic missiles.

In terms of trends, in terms of what the PRC is doing today, what have they done, what they're doing today, and where they appear to be going in the future, they're focused on what I would sort of call four sets of capabilities.

The first set is in the area of short-range ballistic missiles, roughly between I'll sort of set the limit at 600 kilometers out to maybe 1,000 kilometers. Right now, five short-range missile brigades arrayed against Taiwan. Many tend to sort of use the metric of numbers of missiles in terms of the sort of the challenge they pose, but actually it's the organization and it's the doctrine that are more important than the numbers themselves.

Five brigades, six battalions per brigade, two companies underneath, with about two or three launches per brigade, that comes out to about anywhere between 150 and 180 missiles in terms of the salvo size, raid size, to be launched against a defender at any one time. So it's a significant challenge to defend against them with short range ballistic missiles.

And what they're doing now in terms of their trends is upgrading, introducing new variants of the two major types of ballistic missiles as they go along.

A second aspect is medium range, extending the range of their firepower out to, let's say, for example, 1,700 kilometers, that is able to cover the South China Sea, able to cover disputed territories with India, and, of course, all of Japan.

Right now we're looking at a least eight DF-21 MRBM brigades with at least three that are being equipped with dual capable, both nuclear and conventional DF-21Cs.

The third is ground-launched cruise missiles. These in many ways can be even more of an operational challenge than ballistic missiles in terms of their cost as well as the difficulties in detecting launches and the difficulties in the ability to be able to defend against them.

As of right now, the DH-10, the DongHai 10, their first generation real land attack cruise missile. As of right now, at least three brigades appear to have been equipped with, at least in the beginning stages of land attack cruise missiles, with what appears to be four deployment locations in Southeast China and possibly Hainan Island.

And lastly is in the area of medium-range, basically in terms of future trends, medium range ballistic missiles that are able to strike moving targets at sea. This is an anti-ship ballistic missile that right now appears to be in initial flight-testing stage with the motor and flight vehicle, and ultimately the next step, of course, would be going against a target at sea in a realistic training, in a realistic environment.

So that's where they appear to be going, and they're going even further. They're enamored with concepts of extending the range up to 3,000 kilometers in terms of precision strike in a range of--as well as other sorts of things like, for example, trans-atmospheric vehicles, hypersonic vehicles, that exploit the medium of what's called "near space," between 20 and 100 kilometers altitude.

And with that, I'll wrap it up.

[The statement follows:]

**Prepared Statement of Mr. Mark Stokes, Executive Director
Project 2049 Institute, Arlington, Virginia**

Mr. Chairman, thank you for the opportunity to participate in today's hearing on a topic that is important to U.S. interests in peace and stability in the Asia-Pacific region. It is an honor to testify here today.

In my presentation today, I would like to address some of the challenges presented by the growing People's Republic of China (PRC) arsenal of increasingly accurate and lethal conventional ballistic and land attack cruise missiles. I will first address the perceived nature and intent of the PRC in fielding such a force, then the potential implications that deployments have had on Taiwan, the United States, and others within the region. I will wrap up my remarks with a few issues to consider as you address the PRC's growing political, economic, and military clout within the region.

Aerospace Power in Chinese Strategy

First, aerospace power is emerging as a key instrument of Chinese statecraft. Informed by universal air campaign theory and leveraging the global diffusion of technology, the PRC understands the

potential role that aerospace power can play in pursuing political and military goals.

The centrality of theater ballistic and ground launch cruise missiles in PRC political and military strategy is problematic. Filling the vacuum created by the U.S.-Soviet Intermediate-Range Nuclear Forces Treaty (INF) Treaty, the PRC has relied on theater missiles to compensate for shortcomings in its conventional air forces. In addition to modernizing existing short range (SRBM) variants, China is expanding its medium range ballistic and ground launch cruise missile infrastructure. The conventional theater missile build-up has the potential to create strategic competitions that increase the risks of conflict in the future. China's successes in fielding advanced ballistic and land attack cruise missiles also dilutes international efforts to stem proliferation of weapons of mass destruction and their means of delivery.

The People's Liberation Army (PLA) is rapidly advancing its capacity to apply aerospace power in order to defend against perceived threats to national sovereignty and territorial integrity. Large scale theater missile raids, combined with increasingly sophisticated electronic countermeasures and directed against selected critical nodes within a neighbor's command and control structure and air defense system, could produce sufficient shock and destruction to enable conventional air operations to be carried out at reduced risk and cost.

Because potential adversaries around the PRC periphery have limited countermeasures, ballistic missiles have a strong coercive effect by themselves, whether applied as part of an aerospace campaign or held in reserve. Evolving capabilities include extended range conventional precision strike assets that could be used to suppress U.S. operations from forward bases in Japan, from U.S. aircraft battle groups operating in the Western Pacific, and perhaps over the next five to 10 years from U.S. bases on Guam.

The PLA understands its current limitations. Plagued with a relatively underdeveloped aviation establishment, the PLA is investing in aerospace technologies and strategies that that may offset shortcomings in the face of a more technologically advanced adversary. Because of the inherent difficulties in defending against them, conventional ballistic missiles and land attack cruise missiles (LACMs) have been an attractive means of evening the playing field.

In the near term, the PLA is focused on acquiring sufficient aerospace power to ensure an ability to attain air superiority over Taiwan. PLA analysts envision an aerospace campaign involving the coordinated use of Second Artillery conventional theater missiles, PLA Air Force assets, and electronic countermeasures as integral components of "firepower warfare." Arrayed against Taiwan are at least five short range ballistic missile (SRBM) brigades subordinate to Second Artillery, the PLA's primary strategic strike force. The number of SRBMs, widely cited as exceeding 1300 inclusive of tactical missiles assigned to ground forces, may be less relevant than how Second Artillery is organized and prepared to employ them. A brigade consists of six battalions with two companies each, with two or three launchers assigned to each company. Therefore, a combined force of five brigades theoretically could leverage between 120 and 180 mobile launchers to carry out a salvos fired from multiple axes in order to saturate or exhaust potential missile defenses and paralyze airbases and other military infrastructure. Initial missile raids would create a permissive environment for follow-on conventional air strikes.

Beyond Short Range Ballistic Missiles

However, Second Artillery is moving beyond SRBMs. In order to extend the range of its strategic firepower, Second Artillery has established and is expanding its infrastructure of conventionally-capable DF-21C medium range ballistic missiles (MRBMs) and DH-10/CJ-10 ground launched cruise missiles (GLCMs). Today, China's space and missile industry is reportedly producing MRBMs at a limited rate. However, China's space and missile industry and Second Artillery's MRBM infrastructure, with as many as three conventionally-capable launch brigades established, appears able to accommodate a

significant growth. At the same time, the space and missile industry is reportedly producing as many as 100 new LACMs a year for Second Artillery and probably the PLA Air Force (PLAAF). Second Artillery today has as many as three GLCM brigades home based in southwest China with forward deployment facilities in the southeast part of the country under construction.

The space and missile industry also is developing an MRBM variant that could be capable of engaging naval combatants. Barring deployment of effective defenses, an anti-ship ballistic missile (ASBM) may give the PLA a precision strike capability against aircraft carriers and other naval vessels operating in the Pacific Ocean and South China Sea within 1500-2000 kilometers from the coast of China. Manufacturing facilities for solid rocket motors associated with an initial ASBM variant, designated as the DF-21D, were completed in 2009. Flight testing of the new motor and airframe is reportedly underway. Integrated flight testing of the airframe, motor, guidance, navigation, and control system against a target at sea likely would be the final step in the design certification process. At least one brigade likely has been earmarked for initial introduction of the maritime variant of the DF-21 into Second Artillery.

Follow-on ballistic and cruise missile variants incorporating more sophisticated trajectories and missile defense countermeasures could extend the PLA's conventional strike capability out to Guam. Chinese technical writings indicate interest in conventional global precision strike capability over the longer term. In short, as PLA theater missiles incorporate more advanced inertial and satellite aided navigation systems, sophisticated terminal guidance systems, and increasingly powerful solid rocket motors, the accuracy and range of the PLA's conventional strike capability is expected to improve significantly over the next 10-15 years.

Conventional Air Modernization

While Second Artillery has expanded significantly, PLAAF modernization has progressed at a modest pace. The PLAAF's long term vision is to be able to conduct an independent aerospace campaign to achieve decisive strategic effects. Such a goal should not be surprising. Since publication of Giulio Douhet's *Command of the Air* in 1921, airpower proponents have envisioned the transformation of warfare through long-range strategic strikes. PLAAF representatives argue in favor of gradual transition from a supporting service responsible to ground forces for defensive counterair missions and close air support, to joint operations, and finally to a fully independent service able to conduct strategic strike missions at extended ranges. According to one assessment, the PLAAF had set a goal to be able to win an independent air campaign within a 1000 kilometer radius around China's periphery by 2010 – one that has not been successful to date – and extend the range to 3000 kilometers by 2030.

Given resource constraints and the overlap in the core mission of strategic strike, the rapid rise of the conventional Second Artillery may have contributed to the relatively modest pace of PLAAF modernization. Another possible constraint has been limitations of China's aviation industry and corresponding reliance on foreign procurement of key systems. Nevertheless, over the coming decade, an increasingly advanced aviation industry may be positioned to better support the PLAAF's vision of becoming a world-class service capable of conducting an air campaign independent of Second Artillery.

To close the gap between its doctrinal aspirations and capabilities, the PLAAF has made significant investments into force modernization over the last 20 years. Guided by the development strategy of "integrated air and space" and "combined offense and defense," senior PLAAF leaders note that required capabilities include the capacity to carry out long range precision strike, an ability to attain local or limited air superiority, stealth, "full spectrum" air and missile defense, new "trump card" weapon systems, long range airlift, and unmanned aerial vehicles. As PLAAF Commander Xu Qiliang argued in

a recent media interview, integrating air and space operations is needed to ensure strategic dominance on the sea and ground.

With a long term outlook in mind, the PLAAF is gradually improving its capabilities. The PLAAF has procured new multi-role fighters, invested in sophisticated ground-based air defenses, upgraded existing airframes, procured airborne early warning (AEW) and aerial refueling capabilities, and introduced advanced electronic attack systems, including anti-radiation systems capable of suppressing air defense radar systems. It also has refurbished its strategic bomber fleet and procured an air-launched variant of the 2000-kilometer range DH-10 LACM.

Enabled with aerial refueling, supported by initial Second Artillery firepower, and direction from airborne early warning assets, the PLAAF is improving its ability to conduct interdiction missions at extended ranges around China's periphery. Over time, PLAAF capabilities are likely to expand more rapidly than in the past. Senior officers have outlined PLAAF intent to procure a next generation fighter over the next eight to 10 years. Investments are being made into fielding an advanced active electronically scanned array (AESA) radar, and the PLA General Armaments Department has formed a dedicated expert working group aimed at achieving breakthroughs in stealth technology. China's defense industry is investing resources into designing and developing means of jamming U.S. Joint Tactical Information Distribution System (JTIDS)/Link 16 networks and Global Positioning System (GPS) satellite signals.

In short, the PLAAF is making modest progress in developing advanced capabilities with an eye toward expanding its operational range. The ability to carry out strategic strike missions at ranges of 3000 kilometers or more is viewed as the key to becoming a truly independent service, rather than one dependent on Second Artillery or in support of the ground forces. Despite the PLAAF's aspirations to develop a force capable of an independent air campaign around China's periphery, senior PRC political and military authorities likely will continue to rely on Second Artillery for coercion, strategic strike missions, and suppression of enemy air defenses for some time to come.

Regional Sensor Architecture

The PLA's ability to conduct strategic and operational strike missions is likely to be bounded by the range of its persistent surveillance. To expand its battlespace awareness, the PLA is investing in at least four capabilities that could enable it to monitor activities in the Western Pacific, South China Sea, and Indian Ocean. These include near space flight vehicles, operating at the upper extremes of the atmosphere, may emerge as a dominant platform for a persistent regional wide surveillance capability over the next decade. Increasingly sophisticated space-based systems also could expand the PLA's battlespace awareness and support strike operations further from Chinese shores, as could more advanced conventional long endurance unmanned aerial vehicles. In addition to space-based, near space, and airborne sensors, PLAAF over the horizon (OTH) "skywave" radar systems able to monitor maritime activity out to 3000 kilometers also would be a central element of an extended range air and maritime surveillance architecture.

The PLA's expanding sensor architecture is an integral component of China's evolving concept for integrated air and space defense. The PLA is modernizing its air and space defenses by procuring advanced foreign surface-to-air missile systems, investing in research and development of indigenous air defense systems. Integrated air and space defense also includes an ability to counter foreign space-based surveillance and ballistic and land attack cruise missiles. After outlining a 15 year three-phase missile defense development plan in 1996, China's space and missile industry conducted successful tests in January 2007 and January 2010, thus demonstrating an ability to intercept satellites in low earth orbit and

rudimentary medium range ballistic missiles during the mid-course of their flight.

Implications for Strategic Stability

In summary, the Asia-Pacific region is in the midst of fundamental change with implications for strategic stability. The gradual expansion of China's long range precision strike capabilities, especially its increasingly sophisticated conventional ballistic and ground launched cruise missiles, is altering the strategic landscape. Due their speed, precision, and difficulties in fielding viable defenses, these systems – if deployed in sufficient numbers – have the potential to provide the PRC with a decisive military edge in the event of conflict over territorial or sovereignty claims. However, more importantly, the reliance on ballistic and extended range land attack cruise missiles incentivizes other militaries to develop similar capabilities.

Following the PRC's example, a number of militaries in the region have deployed or are developing extended range land attack cruise missiles. The most noteworthy include Taiwan, South Korea, India, and Pakistan. In 2007, the Russian Federation publicly announced the possible withdrawing from the INF Treaty, in part due to the proliferation of systems that the agreement currently restricts. In general, the central role that advanced ballistic and land attack cruise missiles play the PRC's political and military strategy dilutes international efforts to stem proliferation of the means of delivery for weapons of mass destruction.

To address the challenge, a two track approach may be worth considering. First is to maintain or develop the means to undercut the political and military utility of the PRC's theater missile-centric strategy. Investing in U.S. capabilities best able to counter PRC advances in long range precision strike assets is key, as is supporting modernization efforts of our allies and friends. However, rolling back the missile problem arguably starts with Taiwan. The potential for PRC coercive use of force to resolve political differences with Taiwan has and likely will remain the primary flash point in the region. It is also the contingency that most likely to bring the U.S. and China into armed conflict, as well as others in the region.

With the foregoing in mind, a relative erosion of Taiwan's military capabilities could create opportunities and incentives for Beijing's political and military leadership to assume greater risk in cross-strait relations, including resorting to force to resolve political differences. Furthermore, a useful political threat, such as the one Taiwan ostensibly poses the Communist Party of China, helps justify defense budget increases in a resource constrained bureaucratic environment and allows for an accelerated pace of modernization without causing excessive alarm from others in the region. Therefore, a U.S. policy containing a mix of positive and negative incentives intended to encourage Beijing to draw down its SRBM infrastructure opposite Taiwan.

A second track could involve cooperative threat reduction programs, including greater support for Russian calls to globalize the INF Treaty, which eliminated U.S. and former Soviet ballistic and ground launch cruise missiles with ranges of between 500 and 5500 kilometers. It is useful to note that the PRC's conventional theater missile build up fill the vacuum created by the INF Treaty. Existing frameworks for controlling missile proliferation, such as the Missile Technology Control Regime (MTCR), have been insufficient in halting or reversing proliferation. Alternatives to a global INF Treaty exist, including an international missile test ban agreement or revisions to the MTCR. Regardless, undercutting the political and military utility of land based ballistic and ground launched cruise missiles could help enhance strategic stability in the Asia-Pacific region.

HEARING CO-CHAIR BLUMENTHAL: Thank you very much.

Mr. Ulman.

**STATEMENT OF MR. WAYNE ULMAN
CHINA ISSUE MANAGER, NATIONAL AIR AND SPACE
INTELLIGENCE CENTER, DAYTON, OHIO**

MR. ULMAN: Thank you.

Good morning. Let me begin by expressing my appreciation to the Chairman and the other distinguished members of the Commission. It's an honor to have the opportunity to testify here today.

Much like China as a whole, the People's Liberation Army Air Force, the PLAAF, has been undergoing transformational change over the past decade, from a poorly equipped and trained organization to an increasingly capable fighting force. Dramatic changes have occurred in the areas of mission, personnel, training and equipment. My testimony will seek to briefly explain how these changes have come about, and the implications of these changes, and where things are headed for China's Air Force.

Transformation for the PLAAF began with changes in missions and expectations, from a force focused on territorial air defense to a force with growing regional strike missions and capabilities and long-term expectations of being able to perform extra-regional missions supporting PRC national objectives.

PRC's primary mission has historically been defense of the homeland. Through the '90s, the PLAAF began to gradually take on longer-range strike missions. These changes were reflected in 2004 when the PLAAF was given its first official strategy of integrated air and space operations, simultaneous offensive and defensive operations.

The new strategy indicates a desire by the PLAAF to integrate the use of space into their air operations. However, it is uncertain as to what role the PLAAF sees itself in managing these space capabilities. Space and counter-space capabilities are still relatively new to the PLA, and a variety of writings would indicate that there remains uncertainty about who will ultimately manage and operate space and counter-space capabilities.

More broadly, the PLAAF has undergone rapid evolution in their overall doctrine, from preparing for "local wars under high-tech conditions" in 1993 to preparing for "local wars under informationized conditions" starting in 2002. The PLA now seeks to improve their use of information, to deny enemy use of information, and to control the

electromagnetic spectrum.

PLA efforts to improve their own use of information includes improving all aspects of ISR, increasing capabilities for cyber operations, and improving joint communications. Their efforts to deny enemy information include electronic warfare, counter-space, denial and deception, and improved secure communications.

Most recently, President Hu in 2004 has called upon the PLA to prepare for "the historic missions of our military in the new period of the new century." The PLA will increasingly be called upon to protect and support PRC interests worldwide.

During the past two decades, PLA operational planning has evolved primarily for two purposes: first, viable military operations for use against Taiwan, and second, the ability to counter U.S. intervention in any Taiwan contingency.

In developing viable military options against Taiwan, the PLA has doctrinally defined a number of options, including strikes against Taiwan, strikes against Taiwanese offshore islands, various blockade operations, and landing operations against Taiwan and its offshore islands.

Strike operations would be conducted jointly by the 2nd Artillery Corps, the missile forces, and the PLA Air Force, with missile forces likely comprising the initial strikes. Opening focus would likely be against air defense assets in order to achieve air superiority. Critical to the success of these efforts would be electronic warfare and cyber operations aimed at gaining superiority in the information and electromagnetic domains.

PLA doctrine defines joint blockade operations for use against Taiwan. Elements of these operations could include air blockades conducted by the PLA Air Force and 2nd Artillery Corps, and a naval blockade conducted by the PLA Navy and supported by the PLA Air Force. Enforcing a joint blockade would likely involve kinetic strikes against ports, airfields and air-defense assets.

As part of Taiwan planning, the PLA has also prepared itself to counter expected U.S. intervention in support of Taiwan. Based on careful analysis of U.S. warfighting over the past 20 years, the PLA has developed strategies and equipment which they believe will blunt U.S. strengths and exploit U.S. vulnerabilities.

Elements of this strategy include weakening U.S. airpower by striking bases, carrier strike groups, and supporting elements such as logistics, communications, and C4ISR, including space assets.

Attacks against U.S. basing infrastructure in the Western Pacific would be conducted by the PLAAF in conjunction with the 2nd Artillery Corps. Conventional cruise missiles and ballistic missiles would likely

conduct the initial strike, followed closely by PLA Air Force anti-radiation UAVs, jamming aircraft, and strike aircraft armed with precision guided weapons, with the goal of reducing the effectiveness of U.S. strike forces by shutting down air operations.

Against carrier strike groups, the PLA Air Force would primarily support and protect PLA Navy forces with the Navy and the 2nd Artillery providing the strike elements.

At longer ranges, PLA capabilities are still limited. The PLAAF has only limited capabilities to threaten U.S. facilities on Guam, but appear to be working towards longer-range strike systems to rectify this shortcoming, including a longer-range version of the B-6 bomber armed with long-range land attack cruise missiles.

Overall improvements in PLA capabilities over the past decade are undeniably tied to improvements in weapon systems. The PLA can now boast nearly 500 fourth generation fighters equipped with modern jammers, communications, radars and weapons, making them technically comparable to legacy U.S. fighters.

Just as important are advances in other key areas including new doctrines, increased emphasis on training, efforts to streamline and professionalize the PLA, and last, but not least, a clear sense of mission and purpose.

In 2009, the PLA implemented new training regulations, emphasizing joint training and training in an electromagnetic rich environment, including electronic warfare, also improved emphasis on realism in training and increased use of opposition forces, known as "Blue Forces."

Within the PLA Air Force, most tactical training now seems to contain both opposition forces and the use of electronic warfare.

The PLA Air Force has worked diligently at improving the caliber of their air crews. PLAAF pilots are now considered professional and well-trained. PLAAF pilots regularly fly between 100 and 200 hours per year depending on aircraft variants. In terms of safety standards, nighttime flying, post-mission debriefing and overall training syllabus, PLAAF pilots are likely approaching NATO standards.

At all levels, the PLA Air Force is well on their way to becoming a world-class air force, capable of supporting Beijing's regional and eventual global goals.

Thank you very much.

[The statement follows:]

**Prepared Statement of Mr. Wayne Ulman
China Issue Manager, National Air and Space Intelligence Center,
Dayton, Ohio**

Let me begin by expressing my appreciation to the Chairman and the other distinguished members of the U.S. – China Economic and Security Review Commission. It is an honor to have the opportunity to testify here today.

Much like China as a whole, the People's Liberation Army Air Force (PLAAF) has been undergoing transformational change over the past decade, transforming itself from a poorly equipped and trained organization into an increasingly capable fighting force. Dramatic changes have occurred in the areas of mission, personnel, training and equipment. My testimony will seek to briefly explain how these changes came about, the implications of these changes, and where things are headed for China's air forces.

1 - To what extent have China's air forces (to include PLAAF and PLANAF) improved over the past 10 years? Describe their strengths and weaknesses.

The capabilities of China's air forces, particularly those of the PLAAF have improved dramatically over the course of the past decade. From an overly-large, technologically inferior force, the PLAAF is emerging as a well equipped and increasingly well trained force with some identifiable shortcomings and weaknesses. All indicators point to the continued improvement of both PLA Air Force, and PLA naval aviation over the next decade, to the point where China will have one of the world's foremost air forces by 2020.

Transformation in the PLAAF began with a change in mission and expectations; from a force focused on territorial air defense, to a force with growing regional strike missions and capabilities, and long-term expectations of being able to perform extra-regional missions supporting PRC national objectives.

Accomplishment of this growing mission set is only possible with increasingly professional and well trained personnel. Since the late 1990s the entire PLA has become a much more professional force. By the late 1990s the PLA had been forcibly divested of most of its commercial activity and was undergoing a series of major personnel reductions. These reforms resulted in a smaller, less corrupt, more professional PLA with a greater focus on soldiering. The late 1990s also saw the creation of a professional Non Commissioned Officer (NCO) Corps in the PLA. The increasing use of complex, high-technology systems in the PLA Air Force, Navy, and Second Artillery Corps (China's missile forces), were not well suited to the high rate of personnel turn-over resulting from enlisted conscription. The professional NCO Corps has quickly grown in size and importance in these services; some 60% of PLAAF enlisted are now professional NCOs. But the relatively short time these programs have been in place means there are still shortages of the most experienced NCO.

Educationally, the PLAAF has sought to increase the number of college educated officers. According to the PLAAF, some 40% of officers have bachelor degrees, while 3% have postgraduate degrees. However, only about 30% of these bachelor degrees are from full-time university study. Formal education is a top priority for the PLAAF, but their education numbers are expected to remain below levels of USAF officer education for the foreseeable future.

Since 2000, the air forces have significantly shrunk in size while greatly increasing their number of modern aircraft. In 2000, the combined Air Force and Navy air force had over 3000 fighters, almost all of which were antiquated F-6 and F-7 variants (modeled after Soviet MiG-19 and MiG-21). Of this number, only the approximately 50 Su-27 would be considered modern fighters (4th generation). Today, total fighters have been reduced to approximately 2000 aircraft, nearly 500 of which are modern 4th generation aircraft. The PLAAF has also brought on-line critical force multiplying aircraft for Airborne Early Warning & Control (AEW&C), Electronic Warfare (EW), and Intelligence Surveillance & Reconnaissance (ISR).

Likewise, the PLAAF has made a tremendous investment in ground-based air defenses. By 2000 the PLAAF had begun modernizing their Surface to Air Missile (SAM) forces with the purchase of advanced

Russian SAMs. Since then, the PLA has purchased additional units of Russian SA-20, plus China has begun the deployment of the domestically produced HQ-9, a SAM comparable to the SA-20.

Looking at China's air forces today, we see they have made tremendous progress in the past decade. Specific **strengths** include:

1. Nearly 500 4th generation fighters that can be considered at a technical parity with U.S. legacy fighters.
2. Internal lines of communication and redundant infrastructure for basing and C4, well suited for any Taiwan related contingency.
3. One of the world's most advanced and robust air defense network.
4. A limited set of well defined missions associated with a very specific set of contingencies - allowing the PLAAF to apply a greater amount of their time focused on the tasks that they believe are most important.
5. A willingness to plan for, and accept, extensive losses as evidenced by history and PLA writings.
6. A strong motivation to improve, as indicated by PLAAF willingness to be self-critical and increasing willingness to implement change.

China's air forces also have **weaknesses**:

1. Difficulties recruiting and retaining the number of high-tech officers and enlisted troops needed to operate a technologically advanced military.
2. Pilot training, experience, and the development of tactics is still not at the level of the best western militaries.
3. Many of the key supporting aircraft are not yet operational, or are not yet deployed in sufficient numbers. The KJ-200 and KJ-2000 AEW&C aircraft may just be reaching operational status and have not yet been built in large numbers. Tanker aircraft are in short supply (although few of the missions directly related to a Taiwan military contingency require extensive tanker support). The PLA does not yet have sufficient numbers of large transport aircraft for missions such as strategic lift, aerial refueling, and AEW&C.
4. Lack of PLA corporate experience with modern combat. Although they have studied modern combat extensively, the most recent combat for the PLA was the Sino-Vietnam conflict in 1979, a conflict which the PLAAF played almost no part. This lack of live experience presents difficulties in

validating tactics, procedures and concepts and can lead to misjudgments.

5. The PLAAF and other PLA services appear proficient in conducting detailed planning, but there is significant uncertainty about their ability to react effectively to a very fluid, dynamic military situation.
6. Continued PLA reliance on a fairly inflexible C2 structure, and PLAAF reliance on a ground-based command architecture (which may only be a weakness if it can be exploited).

2 - Describe the PLAAF's missions.

The PLAAF's primary mission has historically been defense of the homeland and providing support to PLA ground forces. Historically, PLAAF equipment and training were consistent with these missions.

Over the past two decades, the PLA has undergone a rapid evolution in their overall doctrine. Based on world events and PLA analysis of U.S. military operations, in 1993 the PLA modified their highest level of doctrine, the Military-Strategic Guidelines. At the time, the PLA was instructed to prepare to fight "Local Wars Under High-Tech Conditions," in essence to prepare the PLA to fight the type of high-tech war conducted by the U.S. military in the 1991 Persian Gulf War. These guidelines were further modified beginning in 2002 when President Hu first proposed modifying them to reflect the importance of information, space, and the electromagnetic spectrum. This resulted in the guidelines being re-issued as "Local Wars Under Informationalized Conditions." In essence, the PLA now sought to improve their use of information, deny enemy use of information, and to control the electromagnetic spectrum. Efforts to improve PLA use of information include improving all aspects of ISR, increasing capabilities for cyber operations, and improved joint communications. Efforts to deny enemy information include electronic warfare, counter-space, denial & deception, and secure communications.

The final major driver for the development of PLA forces and doctrine was President Hu's desire for the PLA to begin preparations for non-traditional security operations and operations beyond Taiwan. This desire was articulate in 2004 by Hu as "The Historic Missions of Our Military in the New Period of the New Century." In the future, the PLA will increasingly be called upon to protect and support PRC interests world-wide.

In terms of strategy, the PLAAF did not have its own strategy until 2004 when "Integrated Air and Space Operations, Simultaneous Offensive and Defensive Operations" was announced. This strategy had been under development for quite some time. To put this into perspective, the PLA Navy has had their service-specific strategy, known as "Offshore Defense" since 1986.

In dissecting the PLAAF strategy, "Simultaneous Offensive and Defensive Operations" mandates the PLAAF prepare for various offensive missions in addition to maintaining their long-standing defensive missions. The PLAAF is increasingly equipped with multi-role fighters and now trains for both offensive and defensive operations.

Of greater uncertainty is the phrase "Integrated Air and Space Operations." PLAAF writings seem to indicate a desire by the PLAAF to integrate the use of space into their air operations. PLAAF writings indicate a view that they will naturally be users of space based capabilities; however it is uncertain what role the PLAAF sees for itself in managing space capabilities. Space and counter-space capabilities are still relatively new to the PLA, and a variety of writings would indicate that there remains uncertainty about who will ultimately manage operate space and counter-space capabilities.

3 - Have these missions changed in recent years? If so, are these changes reflected in similar organizational, material, and doctrinal changes?

The basic missions of the PLAAF have changed rapidly over the past decade and are still in the process of being redefined. As stated, the PLAAF has taken on an increasing number of offensive missions in addition to their traditional defensive missions. These missions require the PLAAF to operate at greater distances from home bases and increasingly require overwater operations. As the PLA prepares for combat in the information and electromagnetic domains, the PLAAF is undergoing a transformation to an informationalized force with improved sensors, ISR, communications, and electronic warfare capabilities.

The full set of missions associated with “New Historic Missions” has not completely evolved. The PLA has been given direction to prepare for a wide range of non-traditional missions (e.g., protecting PRC economic interests, preventing hegemony, protecting sea lines of communication, etc.). The service-specific details of these missions do not yet seem to be fully defined, and the resulting equipment requirements may also not yet be fully defined. 2011 will begin a new Five-Year Plan, and the equipment requirements supporting New Historic Missions will likely begin to be addressed with this plan. PLAAF documents have referred to this ongoing transformation as an evolution from “traditional” air force (with primarily defensive missions) into a “strategic” air force (with global missions such as ISR, strike and lift).

4 - Is the PLAAF currently capable of carrying out its assigned missions?

The ability of the PLAAF to execute its assigned missions is largely dependent on the scenario and adversary, and should be examined in the context of overall military campaigns. The PLA has a construct of both single-service and joint-service campaigns designed for implementation during major military conflict. The PLA discusses several different types of campaigns in their doctrinal writings. These campaigns largely reflect doctrinal planning for potential Taiwan military contingencies, including the potential for U.S. military intervention.

Joint Anti-Air Raid Campaign - This campaign is designed as the cornerstone to countering U.S. military intervention and draws heavily on PLA observations of U.S. war fighting tendencies as demonstrated in numerous conflicts including the 1991 Gulf War and 1999 OPERATION ALLIED FORCE. The Joint Anti-Air Raid Campaign has both defensive and offensive components.

Defensively, the PLAAF is responsible for air defense of the mainland, including Beijing and other critical civil and military targets. This mission is accomplished primarily using their SAM and fighter forces, but other PLA services contribute to the effort with electronic warfare, civil air defense, denial & deception, and other measures aimed at resisting precision strike operations.

The offensive component involves attacking adversary airpower at its source by striking airbases, carrier strike groups and support elements such as logistics, communications and ISR (including space assets). PLAAF missions include conducting strike operations, primarily in conjunction with the 2nd Artillery Corps’ conventional cruise missile and ballistic missile forces. Against a base such as Kadena, the missile forces would likely conduct the initial strike - targeting air defenses, airfields and C4 nodes. This would be followed closely by PLAAF anti-radiation UAVs, jamming aircraft and strike aircraft armed with precision guided weapons. The goal is to reduce the effectiveness of enemy strike forces by shutting down air operations. Against carrier strike groups, the PLAAF has primarily a role of supporting and protecting PLA Navy forces. The actual strikes against naval targets would likely be left to the PLA Navy using aircraft, surface ships and submarines - all armed with anti-ship cruise missiles.

The PLAAF is well equipped and relatively well trained to execute air defense mission. Offensively, the PLAAF and 2nd Artillery Corps are equipped to execute strike operations against bases such as Kadena - including multi-role fighters with precision strike weapons and SRBMs and MRBMs with tailored warheads. The success of these operations would depend on many variables, including the ability of the

PLA to effectively coordinate operations between services, the preparations and actions of any adversary, and the actual situation at the time of combat. Less certain is the PLAAF's ability to operate effectively in a dynamic combat environment or after the initial stages of a conflict. Their ability to sustain operations over an extended period is also an uncertainty. The PLAAF and 2nd Artillery currently have only limited capabilities to threaten U.S. facilities on Guam, due to the distance from mainland China. However, the PLA appears to be working toward longer range strike systems to rectify this shortcoming. For example, PLAAF is developing a longer range version of their B-6 bomber, which will be armed with long-range land-attack cruise missiles. When operational, this system will have the capability to strike targets on Guam.

Joint Fire Strike Campaign - This campaign is designed against targets either on the island of Taiwan, or on the Taiwan off-shore islands. The 2nd Artillery Corps and the PLAAF would work jointly to conduct these operations, with the missile forces likely comprising the initial strike, followed by PLAAF forces. The opening focus would likely be against air and air defense assets in order to achieve air superiority. Critical to the success of this effort would also be electronic warfare and cyber operations aimed at gaining superiority in the information and electromagnetic domains.

The PLAAF is well equipped to conduct strike operations against Taiwan and the Taiwan off-shore islands. Much of the new equipment added to PLAAF inventories over the past decade has been strike capable aircraft. In addition, the 2nd Artillery is equipped with well over 1,000 short range ballistic missiles for use against Taiwan. The PLAAF and 2nd Artillery are well equipped and trained to conduct initial jointly planned strikes. Uncertainty remains as to their ability to react dynamically and to sustain operations over an extended period.

Joint Blockade Campaign - One of the doctrinally defined military options developed for use against Taiwan is a joint air and naval blockade of Taiwan. Among PLAAF missions would be enforcing the air blockade in conjunction with missile forces from the 2nd Artillery Corps. The PLAAF would also provide support to the PLA Navy as they conduct the naval portion of the Joint Blockade. PLA doctrine on Joint Blockade indicates that this operation would be planned as a much more destructive operation than a simple quarantine or embargo. Enforcing the joint blockade would likely involve kinetic strikes against at least ports, airfields and air-defense assets.

The PLAAF is well equipped to conduct both the air blockade, and to support PLA Navy in the naval blockade. Uncertainties involve the ability of the PLAAF to enforce a blockade over an extended period of time, and uncertainty over the effectiveness of PLAAF and PLA Navy joint operations.

Airborne Landing Campaign - Within the PLA, airborne forces belong to the PLAAF. As part of any larger campaign to land forces on the island of Taiwan or against off-shore islands, the PLAAF would have the mission of conducting airborne landing operations. Airborne forces do train regularly, but an overall shortage of heavy-lift transport within the PLAAF would likely limit the scale of any airborne landing operations.

5 - Describe recent developments in PLAAF training. How do China's military aviators compare to those of other militaries?

Due to lack of modern aircraft, the PLAAF was unable to develop and train with modern air combat tactics until the mid-1990s when the first Su-27 entered the inventory. It wasn't until after 2000 that a significant number of units received modern fighters.

Since that time, the PLAAF has worked diligently at improving the caliber of their air crews. Compared to other air forces world-wide, the PLAAF would be considered professional and well trained. In terms of flight hours, safety standards, night-time flying, debriefing, and overall training subjects, the PLAAF is likely approaching NATO standards. PLAAF pilots regularly fly 100-200 hours per year depending on aircraft variant. Transport and bomber pilots are typically at the upper end of this range, as are the pilots

for the most modern fighters. Pilots in units equipped with older aircraft are typically near the lower end of this range. In addition, the PLAAF has worked to increase the amount of simulator training time available to all pilots.

PLAAF pilots train more extensively for defensive operations and should be considered more proficient in these areas. Offensive strike training seems to be trained less regularly and is probably rather inflexible in execution.

Since 2007, the entire PLA has placed an emphasis on joint training and on training to fight under a Complex Electromagnetic Environment (CEME). The PLA believes that any future combat environment will be conducted in a cluttered electromagnetic environment containing emissions from commercial and military systems, in addition to significant amounts of electronic warfare jamming. The PLA is preparing units to operate in this electromagnetically dense environment. As a result, some level of adversary electronic warfare and cyber operations are represented in nearly all training and exercise events. Within the PLAAF, electronic warfare and jamming are important elements in most tactical training.

In 2009, the PLA implemented a new revision of their Outline of Military Training and Evaluation (OMTE) - a regulation guiding how training will be organized, implemented and evaluated. Emphasized in this OMTE were joint training, training in CEME, and improved realism in training, including increased use of opposition forces (known as Blue Force). Within the PLAAF, most tactical training and exercises now seem to contain some level of opposition force participation. Also appearing in this OMTE were new requirements for training in anti-terrorism operations, international peacekeeping and military operations other than war.

Finally, the PLAAF is increasingly seeking opportunities to train with pilots from other countries - particularly with air forces that also train with the U.S. Air Force. The PLA has been conducting annual training exercises with the Russian military since 2005, but the last two years have seen an increase in PLAAF engagement with western air forces. This joint training offers the opportunity to test equipment, procedures and pilot skills with dissimilar air forces. It can also help to mitigate the lack of actual combat experience over the past three decades.

6 - To what extent are PLAAF improvements based on newer and more capable platforms and hardware? Are these domestically built or purchased from foreign sources?

Within the PLAAF, the introduction of modern systems began in the early-1990s, with the purchase of Su-27 fighters and SA-10 SAMs from Russia. At that time, China's aviation and aerospace industries were not yet able to produce modern systems of this class. By the mid-1990s, China signed a licensed production agreement with Russia for production of 200 Su-27. The domestic F-10 was under development, but was not yet ready for production. Although the PLAAF was aware of their need to modernize the force, national priorities were focused on economic modernization, so military modernization progressed at a measured pace.

In 1999, the combination of independence-minded comments by Taiwan President Lee Teng Hui, coupled with U.S./NATO military involvement in Kosovo (without a UN mandate), quickly raised concerns in Beijing. The PRC's leadership perceived that Taiwan was moving more rapidly toward independence, while the U.S. was demonstrating an increasing willingness to become militarily involved in the internal affairs of other countries. The leadership in Beijing decided that an increased priority was needed in order to prepare for possible military contingencies for Taiwan, and for the likelihood of U.S. intervention.

The result over the next few years was an increase in arms purchases from Russia. For the PLAAF, this included the procurement of Su-30MKK multi-role fighters, SA-20 advanced SAMs, and additional Su-27. For the PLA Navy, this included purchase of advanced destroyers and Kilo submarines. Despite these large purchases of entire systems, the PRC retained their long-term goal of becoming independent in the

development and production of arms. So while they bought arms from Russia, they also increased the emphasis on domestically produced weapon systems such as the F-10 fighter and short range ballistic missiles.

Over the past ten years, the PRC has continued to purchase weapon systems, sub-systems, technology and expertise from Russia and elsewhere. However, the trend has moved away from the purchase of entire systems, and a movement toward purchasing sub-systems, technology and expertise. Meanwhile, the PRC defense industries have demonstrated an increasing ability to develop and produce advanced weapon systems. The F-10 is currently in production, upgraded versions of F-10 and F-11 (Chinese produced version of Su-27) have both been developed, and a next-generation fighter (referred to as the XXJ) should be operational around 2018.

Because of the complex nature of modern weapons, coupled with the global market for arms, technology and components, it may never be practical (or desirable) for the PRC to be fully independent in producing all military systems. China continues to lag world standards in some areas of military technology, but is near world-class in many others.

Improvements in PLA capabilities over the past decade are undeniably tied to improvements in weapon systems over that time span. The PLA can now boast 4th generation fighters equipped with modern jammers, communications systems, and weapons. However, improvements in military capabilities should also be credited to advances in other key areas. Since the late 1990s the PLA has implemented new doctrine and strategies more suitable for 21st century warfare. They have placed an increased emphasis on training and operationalizing their military forces. Great strides have been made in streamlining and professionalizing the PLA. Lastly, the PLA has developed a clear sense of mission and purpose, all contributing to a greatly improved PLA military capability when compared to a decade ago.

7 - Describe and evaluate the PLAAF's attempts to establish "strategic projection" capabilities, as stated in China's 2006 and 2008 white papers.

The development of a strategic projection capability is an emphasis for the PLAAF. PLAAF offensive missions in the Joint Anti-Air Raid Campaign demand an ability to hold at-risk targets within the region, including airbases and support facilities. Currently the PLAAF cannot effectively strike out to Guam. However, systems are under development which should place Guam at risk by the middle of this decade. These systems should give the PLAAF a capability to strike targets throughout the entire western Pacific and South China Sea.

8 – Do China's Second Artillery forces – especially its conventional short-range and medium-range ballistic missile forces – obviate the need for traditional air platforms?

The 2nd Artillery Corps is an important component to the PLA's strategy for neutralizing adversary air power, and for conducting offensive strike operations. But this capability effectively augments traditional airpower, it does not replace it. So while conventional missile forces do provide some distinct advantages over airpower, including excellent ability to penetrate air defenses, short time of flight, and reduced training and maintenance (compared to combat aircraft), they do not offer the level of flexibility provided by combat airpower.

9 – What future developments can we expect to see in China's aerospace capabilities?

The PLAAF is working to develop effective counter-stealth capabilities. For more than a decade, China has been working on technologies, systems, and procedures to detect, track and engage stealth aircraft and cruise missiles. They are developing a network-centric kill chain to fuse data from an extensive and diverse sensor network. They are also working to reduce the signature of current aircraft designs and on developing a low-observable fighter. As the PLAAF gains access to reduced signature systems, it will allow the development of tactics, training and procedures for use against low-observable threat systems.

The PLA is working on a very comprehensive approach to information superiority. They seek to integrate electronic warfare, cyber operations, PSYOPS, denial & deception, and kinetic attack to defeat adversary information systems. The PLA seem intent on integrating electronic warfare with cyber operations. Chinese efforts to develop counter-space capabilities are also an important element of this effort to achieve information superiority by denying or degrading adversary ISR, C4, and navigational capabilities. Overall, the PLA considers itself at a fairly early stage of informationalization, with a goal of achieving a fully informationalized PLA by 2050.

The PLA is also expected to continue development of anti-access (what China would refer to as “counter-intervention”) capabilities. Long-range aerodynamic systems, longer range conventional ballistic missiles, and anti-ship ballistic missiles are all under development. As time progresses the ISR, the C4, and the procedures will be developed and refined – giving the PLA the ability to hold at risk all classes of targets in the western Pacific and South China Sea.

PANEL II: Discussion, Questions and Answers

HEARING CO-CHAIR BLUMENTHAL: Thank you.

I'll take the first question, if nobody minds. Even if you did. Anyway, the testimony was terrific. I have a question for all of you, but I think, Dr. Cliff, in particular, because it's RAND's report that is on the question of, I guess it was called "The Question of Balance."

So I asked Mr. Lemkin beforehand about some of the conclusions including the defensibility of Kadena and Japan, in general, and the conclusions that some of you had that under certain circumstances, 75 percent of U.S. assets can be grounded on a strike on Kadena because we haven't taken basic steps.

The reason that's, of course, so important--I'm wondering about the general defensibility of Japan given all of your testimony, and the reason, of course, that's so important is because for the United States, that is the single point of failure for projection of power into the region.

So I wonder if I can get all of your opinions on how defensible Japan is under current circumstances with both the 2nd Artillery forces you described, Mr. Stokes and Mr. Ulman, and the types of precision-guided munitions and other suites of capabilities that the tactical air force has on China?

So you first, Dr. Cliff.

DR. CLIFF: First of all, I should clarify that I wasn't one of the authors of the "Question of Balance." However, I'm quite familiar with the work, and I agree with most of the analysis in there.

I would say, first of all, just speaking to Kadena, Kadena is in a bad place. For the longest time it was a great place because it was, particularly if you are concerned about a war over Taiwan, it's our

closest base to that area. So it was potentially a great operating location. Unfortunately, it is also within range of an increasing number of Chinese conventional ballistic missiles, and now with the Donghai-10 ground-launched cruise missile, also cruise missiles, and so it is becoming increasingly problematic.

So the CONOPS that the Chinese write about and that we have analyzed a lot at RAND consist of using conventional ballistic missiles to do one of a couple of things. One is to cut the runways using runway penetrating submunitions, create enough craters on the runways that there isn't an undamaged strip of runway long enough for fighter aircraft to take off.

Once you've done that, your aircraft are pinned on the ground. You can go to Google Earth and count the number of hardened aircraft shelters that are at Kadena. It's 15 so only a relatively small number of aircraft can actually be protected inside those shelters while you're repairing the runways. Anything else that's outside is going to be at great risk to other kinds of attacks, especially since they can't fly up to defend itself.

As you move further up the Japanese island chain, two things happen. One is you get farther from Taiwan. In fact, once you move to the main islands of Japan, you're a lot farther from Taiwan than Okinawa is. You're not necessarily a lot farther from China which is the downside.

Now, you do get farther away from where China's short range and even some of its medium range ballistic missiles are normally stationed, and the other thing is you do increase the number of airbases out of which you could operate. I believe it was a few years ago that in an agreement with Japan, Japan agreed to provide the U.S. with contingency access to airbases at Tsuiki and Nyutabaru. So those are two more airbases that we could potentially operate out of.

The more airbases you have, the less vulnerable you are to ballistic missile attacks, especially in the short run, but you are paying a price because you are now getting much farther away from Taiwan. Defense of U.S. airbases in Japan I think remains problematic, especially over the long term.

Japan itself is certainly, I other than the ballistic missiles, it's not itself really under threat from China. There is no Chinese threat to invade Japan, but if you're worried about U.S. ability to operate out of Japan, that is a concern, and I won't take any more time. I'll pass it to my colleagues.

HEARING CO-CHAIR BLUMENTHAL: What about air supremacy over Japan? I'll let Mr. Stokes or Mr. Ulman answer that.

DR. CLIFF: Okay.

MR. STOKES: Air supremacy over the entire country--I mean I wouldn't rule anything out, but as of right now, there's several factors that one could take into consideration if you wanted to really look at this issue in detail.

One would be the number of targets. Japan has an incredibly large number of airfields. I don't have the exact figure off the top of my head I can throw out. Airfields that are, for example, able to support fighter operation in terms of runway lengths and things like this.

They also have a significant number of air defense systems. The PAC-3s, for example, that Japan has right now or is putting into place I think would be challenged by longer-range medium-range ballistic missiles such as the DF-21C. That together with a number of runways, you're looking at a large number of aim points, large number of targets, that ballistic missiles linked with other strike assets would need to engage.

But there are some other things to watch in terms of intent. Right now deployment of conventionally capable medium-range ballistic missiles appears to be somewhat limited, at least based on the last few DoD reports to Congress.

However, they appear to have an infrastructure and an industrial capacity should they so decide over the next five to ten years to be able to ramp production of 1,700 kilometer range ballistic missiles that can enable an air campaign to gain at least local air superiority, not necessarily air dominance over the whole of Japan, but at least, for example, in a territorial dispute, to be able to go after the Southern Air Defense Region. That's something that is certainly worth looking at, and a lot depends upon the number of medium-range ballistic missiles developed.

HEARING CO-CHAIR BLUMENTHAL: I'm sorry, Mr. Ulman. I got myself over time, and I'm trying to be strict here. So Commissioner Cleveland.

COMMISSIONER CLEVELAND: My question is for Dr. Cliff, although I think, Mr. Ulman, you may have some observations on this issue as well.

You provided a really good review of the strengths and weaknesses of the Air Force, but I'm also interested in your last comment, which you said that they would not be fully modernized for five to ten years. That's a fairly significant range, and I'm interested in what factors, internal and external, you think would make the difference between five versus ten in terms of full modernization?

Is it leadership decisions? Is it access to technology? Is it Taiwan policy?

DR. CLIFF: That's a great question. I would say, first of all,

part of the width of that range is this: my ability to project. And I know in the morning panel, there was some discussion already about how well we as a community of China analysts have done in projecting the rate of modernization of China's military, and so part of it is acknowledging the difference.

I've been surprised--let me just talk about equipment modernization first. I have been surprised at the relatively measured pace of equipment modernization in China's Air Force over the past decade. Wayne talked about China having maybe by today about 500 fourth generation aircraft. It seems to me--and Mark was talking about medium-range ballistic missiles--that they ought to have the industrial capacity to build much faster than that.

So whether what we're seeing is a limitation on their actual industrial capacity or whether it's just a question of level of effort that they've expended so far has been restrained, and there's a lot of evidence that suggests that they are looking fairly long term, that in their own reports, they say they hope to sort of have the modernization process basically completed by around 2020.

There isn't a sense of urgency right now in what I see them doing. Could they crank up the speed on that? Yes, I think they could, and I think the stimulus for that would be some type of political event, some type of crisis between us and them and/or Taiwan that could cause them to change their view that, the next out to 2020 will be a period of peace and development, and we don't really need to emphasize our military modernization.

I think they could definitely increase the rate at which they're doing that. I would say the difference between five years and ten years is probably political events that would occur between China, the U.S., and Taiwan.

MR. ULMAN: I'll add a few more comments on that. The modernization on the equipment side I think has been relatively rapid since 2000. You went from having a few dozen fourth generation fighters in around 2000 to now having nearly 500. So that's a pretty significant move forward.

Theoretically, you probably could have brought more into the force, but there may well be an issue in terms of how fast you can assimilate all this new technology into the force and train up the fighter pilots to use it. I think the focus for the PLA more broadly, but specifically the PLA Air Force, at this point in time is really the operationalization of all of these capabilities.

You've really got to make sure everybody understands how to use it, how the various forces work jointly together. That's still an issue that presents some challenges, I believe, for the PLA writ large. So

they've certainly got the theory and understand how the PLA Air Force, the Navy, the 2nd Artillery needs to work together jointly to achieve certain missions.

But their ability to actually execute this is probably not quite there yet. A couple other things. Just real briefly, is the other focus, as I mentioned briefly in my testimony, is the informationalization. So this is your ability to be able to jointly communicate, to be able to have say a joint ISR picture that can be shared across all the services to allow you to have that kind of information dominance.

The Chinese are working, the PLA is working, very hard towards achieving that goal. They've put a lot of ISR systems online in the last ten years, but again I think they're still working through a lot of the process, organizational kinds of issues. It's taken us many decades to achieve this capability. They're a fast follower. They're moving along quite quickly and rapidly, but I don't think they're quite there yet.

So Roger's estimate of five to ten years, maybe that's right. Modernization is a journey. It's not an endpoint. So it's hard to say when you can say they're modern.

HEARING CO-CHAIR BLUMENTHAL: Commissioner Fiedler.

COMMISSIONER FIEDLER: Thank you.

Mr. Stokes, let me give you a quick overall simplification of my view, and you see if I'm off or not. The Chinese actually are doing what was most in their interest as a growing power: denying us options in what they deem their core interest, Taiwan; complicating our policies; extending their defenses farther out, which also has the offensive effect of increasing their power to implement their territorial claims within the region, which has spooked regional powers; set off-balance our alliance with Japan, forgetting politics, just on the hardware side; bought themselves a considerable amount of time by focusing on ballistic missiles in space because it takes longer to develop conventional forces because they involve people that you need to train.

Sounds like a pretty cogent strategy to me, and that simple comparisons between the United States' capabilities and the Chinese capabilities are sophomoric almost in the sense that that's not what the world is about. I mean their goal is not to go necessarily head-to-head with us.

Am I off on that?

MR. STOKES: No, sir. You summed up rather nicely. The issue I would have is their goal in terms of territorial goals and trying to sort of do whatever they have to do to be able to achieve their immediate or short-term objectives, the way that they're doing that, it meets their goals; it's how they're doing it that's problematic, in terms of the reliance on the ballistic missiles.

COMMISSIONER FIEDLER: Long term, yes.

MR. STOKES: Well, long-term is going to be a little bit different because I don't think--

COMMISSIONER FIEDLER: They're going to rely on it for that long?

MR. STOKES: Well, that--what did you say, sir?

COMMISSIONER FIEDLER: I don't think they're going to rely on it entirely for that long; right?

MR. STOKES: Yes, sir. That is the way that I see things going. The PLA Air Force, at least the things that I've seen in terms of what--their long term goal, and I say long term, we're talking 2020, 2030 even, is as any good air force should do, their goal is to be able to conduct independent operations out to, for example, basically be able to break down a door and gain air superiority around their periphery, let's say out to a range of, for example, 3,000 kilometers independently without having to rely upon the 2nd Artillery to break that down, to be able to suppress enemy air defenses. That's a long-term goal, and the U.S. Air Force, of course, when we became an independent service, that was our goal as well.

COMMISSIONER FIEDLER: We were emphasizing everything that was east of us if we're sitting here--Japan, sort of Taiwan. We were not talking about the Indian Ocean, Africa. I want to add one element to this. Clearly, it is in their national interests to independently have the capability to protect their sea lanes. You can't be running around the world buying up and trying to lock down resources the way they are with having that strategic hole unfilled.

So we haven't talked about their ability, and 3,000 clicks is not far enough, but then you have to do something else in order to project your power towards those resources. Can somebody address what they're doing on that?

MR. STOKES: I'll let somebody else take that one.

COMMISSIONER FIEDLER: Okay.

MR. ULMAN: I could probably speak to that. As mentioned in the testimony, that's what President Hu was talking about when he refers to new historic missions. It's going, having the PLA have the capability to protect Chinese interests worldwide, you know, securing lanes of commerce, securing overseas resources if needed, and the PLA has a long, long way to go on that. They've just now, over the last year roughly, begun supporting piracy operations off Somalia, that's been a big step forward for the PLA Navy.

The Air Force is short on critical things like strategic lift, long-range ability to do air-to-air refueling, long range--very long range strike capabilities. These things are going to be in the developmental

stage, they're going to move that direction. It's going to take them a little while, but they definitely see that as a direction they need to go.

And that's where you start to need have an air force, and you can't rely just on a missile force. You can't do those kinds of things with a missile force.

HEARING CO-CHAIR BLUMENTHAL: Thank you.

Commissioner Brookes. I'm just kidding. I just wanted to see if you were awake.

Commissioner Wortzel.

COMMISSIONER WORTZEL: Thank you, all three of you, for your written and oral testimony.

Dr. Cliff, on pages six and seven of your written testimony, you talk about a struggle currently underway within the People's Liberation Army over the control of space operations, and I got a few related questions that any of you may be able to respond to.

First of all, what space assets are controlled by the General Armaments Department and what's the function of those assets?

Second, are the 2nd Artillery controlled space assets integrated into a national system, and if so, what PLA department prioritizes and integrates space assets? Does the PLA Navy control any space assets? And who controls R&D and future requirements for space assets? You raised this, so you can start.

DR. CLIFF: I will tell you what I know since you asked me first, and then I'll let my colleagues contribute what I don't know.

My understanding is right now that China's military space assets are controlled by a combination of the General Armaments Department and the General Staff Department, that the Chinese Air Force despite their rhetoric does not control any space assets. The 2nd Artillery--how do we want to say that--does not control anything that orbits in space.

Now, the 2nd Artillery position is things that pass through space--and, in fact, this is the U.S. Air Force position, too, these days--things that pass through space are also space assets. So that means ballistic missiles are a space asset because they pass through space on their way to their targets.

So that would imply that both China's nuclear forces and even its conventional ballistic forces, ballistic missile forces are also space assets, but they don't currently control anything that orbits. So the fight is on. The Air Force basically is taking the U.S. Air Force position that anything that passes through or stays in space ought to be owned and controlled by the Air Force.

2nd Artillery is saying, no, we need a separate space force. They don't then say that 2nd Artillery ought to be in charge of it, but one could imagine a space force that had two branches, one being ballistic

missiles and things like ballistic missiles, like--I don't know--say a direct ascent anti-satellite weapon, and then the other branch would be things, satellites, things that are actually orbiting in space.

That's where we are right now. I see no evidence from the open source materials that I looked at that that debate has been resolved. So I'll let me colleagues chime in now.

MR. STOKES: When you say "space control," there's several different aspects to it. You've got the space launch mission. You've got the guys who would actually fly the satellites, satellite operations. You got the tracking, telemetry, control system, basically the space monitoring system, and then you have counter-space, which could include, for example, electronic warfare. It could include direct-ascent satellites.

Today, I agree, the space launch mission, of course, still under General Armaments Department. The TT&C mission, generally General Armaments, although I haven't looked into it as much as I should, but I'm seeing some signs of possible Air Force management. For example, they are in charge of the over the horizon "skywave" OTHB radar.

The counter-space mission, this is where sort of things get a little fuzzy. For jamming operations, I've seen some indication of 2nd Artillery having independent units, as well as the General Staff Department Fourth Department where they have two independent, two independent electronic-countermeasure brigade level organizations for jamming.

And then the direct-ascent satellite, I've only seen one reference to at least they seem to be settling into sort of a division of effort where the Air Force, for example, is really on the missile defense side, where the Air Force possibly could take terminal missile defenses or anything that would be below 100 kilometers in altitude, for example, and above the 100 kilometer limitation could be 2nd Artillery.

But I think all these things are still unclear. I've seen references to 2nd Artillery having a sort of space unit, some kind of space units, but I'll pass it on.

MR. ULMAN: Yes. I think a lot of this is still to be determined, and particularly if you look at what some of the things that are showing up at air shows and showing up in research papers, the potential for space-based counter-space weapons of various kinds, things that might get launched off of an airplane. So there's a lot of things that really muddy the water in terms of making it clear who would have primacy for counter-space, in particular.

If you look at the General Armaments Department, their primary role is really the R&D and Acquisition arm of the PLA. It seems unlikely to me that over the long run, they will have, primary

operational military control over space and counter-space assets. They may still be the ones that fly the satellites, but in terms of actually commanding things, I think that's unlikely.

COMMISSIONER WORTZEL: Thank you.

HEARING CO-CHAIR BLUMENTHAL: Commissioner Wessel. I won't call on other commissioners if they don't have questions, I promise.

COMMISSIONER FIEDLER: I have questions.

COMMISSIONER WESSEL: Thank you, gentlemen, for being here.

We've had, both on this panel and earlier, a question about surprises, development in terms of China's capabilities, and we've heard various statements about what the horizons are.

Two questions. What do you see as our greatest vulnerabilities in that time horizon vis-à-vis any kind of potential conflict with Chinese forces in the aerospace area, number one?

And number two, with increasing reports of Chinese cyber espionage, have we seen any results of that in terms of Chinese capabilities, either in terms of accessing technologies that may have advanced them in certain areas that we would not have expected otherwise or as to the vulnerability issue, in terms of countermeasures or concerns that you might have that has resulted from that? Each of the witnesses, please.

Do you want to start, Mr. Ulman?

MR. ULMAN: Sure. I'll start with the second one dealing with the cyber espionage, and I would say that it would be difficult at the moment to be able to tell what the direct impact of that has been. If you look at the development of aerospace industries now, it's a very different situation than we had back in the Cold War with the Soviets. The Soviets were largely on their own to develop everything, kind of bootstrap their way up.

The situation that the Chinese have is they've got active commercial ventures with various Western partners. They have pretty broad kind of co-development technology transfer with the Russians and others. They can access the world market for technology in general so it's a much more globalized situation for them to be able to advance, which I think is largely the reason why they've been able to progress relatively rapidly now over the last, say, 20 years.

So this, cyber data you may have gotten through cyber about U.S. advanced weapon systems certainly adds to that mix, but, back to my initial point there--it's hard to tell exactly what the impact has been right now.

MR. STOKES: Just a general comment about the issue of cyber

espionage or other forms of clandestine collection. My impression is that to agree with Wayne, the global diffusion of technology, in general, is opening doors for China and for all research and development communities in way that I think is underestimated.

Basically because of the diffusion of technology, it decreases incentives to be able to engage in sort of clandestine acquisition of technology, and another aspect of I think what sort of decreases the requirement for clandestine means is besides the fact there are engineers, it's a talented group of engineers that they have, and when they focus on an issue, if they want to achieve some sort of a breakthrough in a very specific technology, they have developed organizational structures and bureaucratic means to be able to consolidate resources and bring together, be able to bridge some of the bureaucracies, whether it's academic community, research and development community, military communities, to be able to achieve breakthroughs.

Another aspect of this is emphasis on dual-use technologies. If they had a technical bottleneck on a military program, and there's a dual-use aspect of a specific technology, it's really not an issue to go and visit a university that specializes in a particular technology.

One of the best examples, in their ASAT program, 1998, where you had the guys that were working on this program simply called and attend a conference and were able to visit people who specialize in this particular area at an American university. So you don't have to do clandestine when you can walk in the front door.

COMMISSIONER WESSEL: Dr. Cliff.

DR. CLIFF: I just wanted to talk about the first part of your question, which was about U.S. Air Force vulnerabilities or U.S. military vulnerabilities to China, and I would focus on one thing which we sort of alluded to before, which is the vulnerability of U.S. aircraft when they're on the ground, and this is something that RAND has been publishing research on for over a decade, and it fits with the Chinese view of Air Force operations which is the way to defeat an enemy air force is on the ground.

So it's the combination of the ballistic missile capabilities that they're developing that are the enabler for other types of systems, whether those are ground-launched cruise missiles or aircraft with precision guided munitions.

If we can get up in the air in equal numbers as they, we can win. The problem is they have the ability to either destroy us on the ground or force us to operate from airbases that are so far away that the number of aircraft we can put in the air is so vastly outnumbered that in some cases our aircraft just don't carry enough missiles to actually--you

run out of missiles before the Chinese run out of airplanes.

That's one vulnerability, and now that with the anti-ship ballistic missile that Mark has written so extensively about, that vulnerability is now extending to sea-based airbases, that is aircraft carriers potentially.

I think it remains to be seen exactly how severe that threat is and whether or not there are counters to it, but I would say those are the two emerging vulnerabilities in our way of conducting a potential war against China in the future.

COMMISSIONER WESSEL: Thank you.

HEARING CO-CHAIR BLUMENTHAL: Commissioner Bartholomew.

VICE CHAIR BARTHOLOMEW: Thanks very much and thank you to all of our witnesses. I'd like to also extend a particular thanks to Mr. Ulman for your assistance with setting up our briefings at Wright Patterson Air Force base. We really appreciate your help and appreciate all of your expertise.

I was starting to head down a path of asking about modernization, the pace of modernization, again, and I think I'll get to it, but, Dr. Cliff, do I understand you correctly, that you just said that China essentially already has the capability to defeat us?

DR. CLIFF: I hope not. Let me see what I said. They have the potential to present significant challenges to us. We are not at war today, and I don't expect us to be at war tomorrow. But as time goes on, and I'm not talking, about 2030 or 2050 here, I'm talking about 2015 or 2016, this problem is starting to get pretty worrisome.

VICE CHAIR BARTHOLOMEW: Then can we go to this issue of modernization--what it means as well as the pace of it. But I want to ask a different kind of question about it, and, Mr. Stokes, given your groundbreaking work recently China's nuclear storage system, I'm not sure it's really fair to include you in this, but I was surprised that Mr. Lemkin--he used a ten-year figure on Chinese modernization. Dr. Cliff, you're saying five to ten years.

But what I was surprised by is that he said that DoD hasn't been surprised by China's modernization to date, and I can think of a few examples that everybody seems to be surprised--the 2007 Anti-satellite test, and submarine developments.

So it took me back a little that he said that. Do you think that the Department of Defense knows what it needs to know to accurately assess where Chinese modernization is?

DR. CLIFF: The short answer to that is yes. They know what they need to know. They have very capable people like Wayne here to inform them and, unlike I live mostly in the open source world, I get to look at what goes on in the classified world too. I would say that there

aren't a bunch of things that I'm hearing about that Wayne doesn't know about. It's more likely the opposite case.

So, yes, they're getting the information. The question is whether or not there's been a sense of urgency, and I realize we're in two wars right now, and those wars demand our attention. Those are real wars ongoing right now.

But you do have to be able to walk and chew gum at the same time, and I think it's time we started chewing the gum a little harder.

VICE CHAIR BARTHOLOMEW: Mr. Ulman.

MR. ULMAN: Thanks for the question. I think one of the important things to really look at is the vector of Chinese modernization kind of writ large. So if you look at the '90s as a decade, the priority for senior leadership in Beijing was really on economic modernization, and they weren't fully funding military modernization.

1999 rolls around, and you've got a couple of critical world events, including U.S. operations in Kosovo, U.S. and NATO operations in Kosovo, and then also what Lee Teng-hui was talking about with the two-state theory, and I think you have a real convergence there that ends up raising the priority of military modernization in China among the leadership so I think a lot more resources start to flow.

You can look at the amount of contracts you have with the Soviets for--with the Russians rather--for particular weapon systems. I think the importance of it all gets ratcheted up at that point, and I think the resources get ratcheted up at that point, and, as a result, the vector changes so your slope changes.

So I think it legitimately took us a little while to detect that change in the slope, because for many, many years, they've been operating in a certain way or at a certain pace in modernization. It's kind of like the stock market, past performance is not an indicator of future success or something to that effect, and so I think it did take us a little while to make that cognitive shift to where the Chinese were going. So that's kind of the broad trend.

In terms of individual weapons that we maybe didn't see coming as quickly as we would have liked, that does happen sometimes. The Chinese are very concerned about security. They are a hard target. They're a challenge. So that stuff does happen and will continue to happen.

VICE CHAIR BARTHOLOMEW: Mr. Stokes, you've done some extraordinary work outside the government as well as the extraordinary work that you did inside the government. Do you think you would have been able to do the work you've just done outside inside the government?

MR. STOKES: Wow.

HEARING CO-CHAIR BLUMENTHAL: He'd have to leak it.

COMMISSIONER FIEDLER: Remember you're not in the government anymore. You can answer the question.

MR. STOKES: No, ma'am. Right now I have the luxury of working in a think tank, and all we do is think. Actually, no, we just have time to be able to study and really dig into issues. When you work in government, you have a thousand things on the plate, and you're going through your inbox.

So these days I have the luxury of doing what I enjoy doing, which is doing, basically going through streams of data and sort of taking my time. So short answer is no, ma'am.

VICE CHAIR BARTHOLOMEW: Thank you.

HEARING CO-CHAIR BLUMENTHAL: I'd also say that a lot of that great work would have to be leaked for you to see it.

Not that I'm encouraging that.

VICE CHAIR BARTHOLOMEW: Or briefed in other settings.

HEARING CO-CHAIR BLUMENTHAL: Yes. Commissioner Shea.

COMMISSIONER SHEA: Thank you.

Dr. Cliff, you mention in your testimony that the PLAAF does not appear--you say does not appear to have a nuclear strike mission. I was wondering is this something that the Air Force is seeking? Is it engaged in the same sort of bureaucratic battle it is vis-à-vis the space operations with the 2nd Artillery and General Armaments? Could you explain what you meant by that?

DR. CLIFF: Sure. Let's see. There are a number of--I haven't done a lot of research on this issue. There are people who also live in the open source world who have come to that conclusion that it does not have a nuclear mission.

In their writings, they don't, certainly don't spend a lot of time talking about nuclear strikes. That isn't to say, obviously, at some time in the past, they did have the mission. That doesn't mean they're not interested in it now, but it just doesn't seem to be a focus for them.

I'll add that our own Air Force is also not terribly interested in the nuclear mission right now. So it doesn't, seem to be interested in space, not all air forces seem to be interested in nuclear strike missions, for whatever reason.

So that's about the best answer I can give to that question.

COMMISSIONER SHEA: Mr. Stokes.

MR. STOKES: I don't have a definitive answer, but here's some things that I would look at. In the past, when the Air Force probably did have a nuclear mission, it would have been associated with tactical, probably tactical nuclear weapons in the form of enhanced radiation

weapons, to be exact, most likely. That was based primarily sort of on Soviet scenario.

Now that tensions have reduced between the two, whether or not they still have an inventory of tactical nuclear weapons, I'm not sure. But the thing to really look at, well, first, besides, in terms of the research that I've done, I don't see sort of the same indications of the air force maintaining, storing and maintaining nuclear warheads themselves.

And that opens the question: if the Air Force did have a mission, who would actually maintain the warheads--Air Force or 2nd Artillery?

But beyond that, the question really should be framed around the DH-10. If the Air Force, if there is an air-launched variant of the DH-10, which I believe there is, and I believe that it's already entered the force, that would be deployed with H-6, for example, a variant of the H-6 bomber, if they had the DH-10, and if the DH-10 is dual capable of both nuclear and conventional missions, then one could conclude that the PLA Air Force could have a nuclear mission. They may not control the weapons themselves, but they may manage the delivery vehicle in support of a nuclear mission.

This is speculative. I'll leave it there.

COMMISSIONER SHEA: Thank you. I guess I have two minutes left or one minute and 50 seconds. Mr. Ulman, could you just give us a little bit more information about China's unmanned combat area vehicle program and how they may be deployed in a Taiwan contingency?

MR. ULMAN: The Chinese have a very dynamic UAV program, working on a lot of systems. They're certainly at various air shows, and through looking at research papers, they're working on a lot of concepts here for various long-range platforms, Global Hawk, Predator type UAVs, for various purposes, including ISR, including communications, relay, electronic warfare, pretty much anything that you might put on that type of platform.

They've also got apparently programs based on what I mentioned before for unmanned combat vehicles so those are things that are kind of in development. You can also look at, you know, they have the Harpy class UAV with the anti-radiation seeker on it. Certainly that would play in any kind of Taiwan contingency importantly.

COMMISSIONER SHEA: Mr. Stokes, did you want to add something?

MR. STOKES: I was just thinking what exactly an unmanned combat air vehicle is. Technically, a cruise missile is an unmanned combat air vehicle, I suppose.

But in terms of the future, what I've been seeing, there's some very, very interesting research and development being done on

specialized or specialized types of I guess a hybrid ballistic cruise missile, one that exploits the special characteristics of what's called "near space." That's that domain between 20 kilometers and 100 kilometers in the atmosphere, very similar to what we're developing in terms of, for example, a global precision strike or hypersonic vehicles.

The research development efforts have gone to the point where they've established a new research institute under their prime organization responsible for development of ballistic missiles and launch vehicles--the China Academy of Launch Technology--that's dedicated toward nothing but near-space flight vehicles.

There's also an ISR component to near space in terms of similar to what we have in terms of high-altitude air ships, but I'll save that for another time.

HEARING CO-CHAIR BLUMENTHAL: Commissioner Mulloy and Commissioner Videnieks, you stand between lunch or you're the only thing that stands between lunch. So if you guys go ahead and ask your five minute question and answer period, we'll wrap up.

COMMISSIONER MULLOY: Thank you, Mr. Chairman. Thank you, all, for your prepared testimony, which was quite helpful.

This Commission was set up to kind of integrate the political, the military, the economic, and so I want to come back to the economic, and this testimony will come later by Mr. Andersen, where he says, quote, "China has a national strategy for the development of its aircraft and parts manufacturing industry."

And then he talks about that strategy which consists of government investment and policies designed to attract foreign partners as well as foreign direct investment in the aircraft and parts manufacturing industry sector.

I look at page eight of Mr. Cliff's testimony, and he says:

"During the 1990s and the first half of the 2000s, most of the PLAAF and PLAN aviation's new platforms were imported, largely from Russia, with some technologies and equipment acquired from Israel and other countries. In recent years, however, the equipment has been increasingly domestically produced."

Do you believe that they do have a national strategy to develop their aircraft industry across the board? Do all three of you agree with that?

[Panel members nod affirmatively.]

COMMISSIONER MULLOY: They do. Do you think part of that strategy is to incentivize Western companies and even American companies to help build their aerospace industry?

MR. ULMAN: You're both looking at me. You want to try that, Roger?

DR. CLIFF: I'm happy to. I've looked at this a little bit before. Okay. So aerospace is a dual-use industry.

COMMISSIONER MULLOY: Yes.

DR. CLIFF: Wayne said it very well earlier, as did Mark. They're getting technological inputs from a whole range of sources. Purely military technology, they're getting from the Russians and Israelis and others. Dual-use technology, because of our Export Control Regime, it's hard for them to get anything very useful or current from us that's truly dual use.

I spoke to the guy who represents Pratt and Whitney, in China, and with Rolls Royce, it's the same thing. The engine technology they transferred to China was already 30 years out of date when they transferred it. That's what they say.

The thing is, to China, that was still new technology so that's giving them a foot on the ladder. China has come up a lot of steps on the ladder now through indigenous research and development, through acquiring what for them is still new technology and so on. They're getting to the point where they can do a lot of climbing on their own.

But a few years ago, there was concern about whether or not the European Union would lift its blanket arms embargo on China, and they were assuring us that they were going to have this toolkit that would prevent transfer of any militarily sensitive technologies, and so on, but my concern wasn't that they were going to transfer military technologies to China, that they were going to transfer generic aerospace technologies to China, and that was going to provide further help to the Chinese defense industry.

So there is this dual-use nature. They are exploiting--exploiting is too strong a word--because they have both commercial and military purposes, they are using Western technology, Western investment, Western quality control techniques, however they can, to improve both their commercial and their military aerospace capability.

COMMISSIONER MULLOY: I just want to ask one final question--and that's their government strategy, as we all agreed. Do you think the United States needs to pay closer attention to what our companies are doing and being incentivized to do by the Chinese government in terms of transferring know-how technology capabilities to China?

DR. CLIFF: I can't speak to whether or not the U.S. is paying close enough attention. I can't say we need to pay more attention. We need to pay attention, but we also have to remember if we don't step into these markets, there's plenty of other willing partners. So that's the tradeoff, as I'm sure this Commission knows all too well, is if we don't do it, well, okay, the Japanese, the Koreans, the Europeans, someone

else will do it.

So you have to find the balance of what is the rest of the world willing to do. You don't want to put U.S. industry at a disadvantage relative to the rest of the world if it's not going to really help our goal of protecting U.S. national security.

COMMISSIONER MULLOY: Thank you very much.

HEARING CO-CHAIR BLUMENTHAL: Commissioner Videnieks. Last words.

HEARING CO-CHAIR VIDENIEKS: A real quick one. What will the next PRC fighter look like? Will it be similar to our F-22? And when will it be deployed?

And then a related question is a lot of people are pooh-poohing the J-6 as being something--

HEARING CO-CHAIR BLUMENTHAL: J-10.

HEARING CO-CHAIR VIDENIEKS: No. I'm talking J-6. The J-10 is the new one. But the J-6 as being--will we send in our Raptor into a swarm of J-6s? That's kind of a rhetorical question.

MR. ULMAN: Yes. I can speak a little bit to China's next generation fighter. This is something that we've been referring to notionally as the "XXJ." Certainly there's plenty of, out in the blogosphere, discussions about what it may actually be called. There may be more than one program underway. Certainly you've got main airframers at Chengdu and Shenyang. At some point both the flanker, the J-11, and the F-10, which is produced at Chengdu, both of those aircraft will run their course, and so there will be some sort of follow-on aircraft probably at both of those facilities.

So both of those are likely to be some sort of next generation system, much as we're doing with F-22 and F-35. We're anticipating China to have a fifth generation fighter that, like I said, we've been referring to as the XXJ, operational right around 2018.

There's a lot of a vagaries in terms of, if they run into some roadblocks that are unanticipated, could be longer than that. If everything goes real smoothly, it could be a little bit quicker than that. And certainly that will have all the major, the major elements that you'd look for in a fifth generation fighter in terms of advanced avionics and radar, low-observable design, potentially super-cruise, all of these things.

It's yet to be seen exactly how that will compare one on one with, say, an F-22, but it will certainly be in that ball park.

HEARING CO-CHAIR VIDENIEKS: Anyone else?

MR. STOKES: Just one quick remark. I would assume for the PLA Air Force or the PLA, in general, the goal is actually not to have to engage an F-22 or any other fighter in the air, for that matter. The

goal is to stop them from taking off wherever they may base. And if that's the case, if you can block a run--or cut a runway, if you can suppress an airbase and air defenses, it may not even be necessary for you to have a fifth generation fighter. That's one point.

The second point is that, at risk of overstating, an airframe is kind of a truck. It's nice if it goes fast and things like this; what really matters is what's inside. It's the avionics, it's the radars, the munitions, and in those cases, you can take, for example, one of their fighter bombers, a J-7, for example, and equip it with very advanced avionics, munitions and supporting software.

As long as you can keep the other guys on the ground without taking off, and your goal is to be able to deliver munitions effectively, then that may do the trick, at least over the next five, five to ten years, until they're able to come up with a more advanced airframe.

HEARING CO-CHAIR VIDENIEKS: Dr. Cliff.

DR. CLIFF: Just to go to the F-22 versus F-6 question, I'm not so worried about the F-6s. The F-6s will never even see the F-22.

HEARING CO-CHAIR VIDENIEKS: I'm talking about the J-6.

DR. CLIFF: J-6. Same thing. I'm more worried about, half a dozen F-22s versus, an entire division of Su-27 or J-11B Flankers. Now these are aircraft that not only potentially have the capability to close with the F-22, but even if they could never actually shoot down an F-22, as some of our analysis has shown, they can go after other things like the AWACS aircraft that the F-22 needs, like the tankers that we would need in order to keep those F-22s in the air that far from our nearest base.

So that's the problem, if the six F-22s shoot down 36 out of 72 J-11B Flankers; what do you do with the remaining 36?

HEARING CO-CHAIR VIDENIEKS: Thank you. Thank you, gentlemen.

HEARING CO-CHAIR BLUMENTHAL: On that happy note, we want to thank you for a great panel. We had a great start this morning. I want to actually thank the staff now because at four o'clock, everyone is gone, and the room will be empty. So Dan Hartnett and Rob Sheldon have done a terrific job staffing up this hearing against great odds in terms of Commissioner availability and all the rest of it. And also thank all of you very much for a terrific panel.

We're going to break for lunch--

VICE CHAIR BARTHOLOMEW: And we'll be back at?

HEARING CO-CHAIR BLUMENTHAL: Back at what time?

VICE CHAIR BARTHOLOMEW: 12:40.

HEARING CO-CHAIR BLUMENTHAL: 12:40.

[Whereupon, at 11:55 a.m., the hearing recessed, to reconvene at

12:48 p.m., this same day.]

A F T E R N O O N S E S S I O N

PANEL III: CHINA'S AVIATION INDUSTRIAL COMPLEX

HEARING CO-CHAIR BLUMENTHAL: We want to welcome everyone back. We're very pleased to have Peder Andersen, Dr. Tai Ming Cheung and Richard Fisher.

I want to point out also just procedurally that Congressman Bartlett is going to stop by to make some remarks at 1:00 p.m., so with your indulgence, we're going to ask you to take a back seat to the Congressman, and then after which time we will ask you to come back and finish up. We have three terrific speakers here:

Peder Andersen from the International Trade Commission, where he's a trade analyst on aerospace issues;

Dr. Tai Ming Cheung, who is an associate research scientist at the University of California, San Diego, Global Conflict and Cooperation Center, and author of *Fortifying China: The Struggle to Build a Modern Defense Economy*; and

Richard Fisher, a Senior Fellow at the International Assessment and Strategy Center where he is an expert on Asian aerospace issues, as well.

I would ask everyone to stick to their seven minute time allotment just so we have enough time for questions and answers afterwards, and I'm actually going to hand it over to Commissioner Videnieks to moderate, but why don't we start with Mr. Fisher.

**STATEMENT OF MR. RICHARD D. FISHER, JR.
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INTERNATIONAL ASSESSMENT AND STRATEGY CENTER,
WASHINGTON, DC**

MR. FISHER: Commissioner Blumenthal, Commissioner Videnieks, I'd like to thank you very much for this invitation back to testify before the Commission. It is always a pleasure to assist your mission, a vital mission for our Congress and for the American people.

I've written testimony that focuses more on output of China's aerospace sector, the result being a bit of a lengthy written testimony, but I will try to summarize that as best I can.

In the main, it's my conclusion that after nearly 30 years of sustained investment that China's aerospace sector is about to enter a period of increasing harvest.

These three decades, to be sure, have been enormously difficult as they've been expensive for the Chinese. After World War II, the chaos

of Mao Zedong resulted in the loss of more than a generation of opportunity for independent innovation and development, which resulted in China spending the last 20 years accumulating and then seeking to absorb the best foreign technology engine aircraft and component technology that it can obtain.

In the 1950s and '60s, Stalin and then Khrushchev essentially transferred the beginnings of China's modern era space sector. But then the sector largely remained static until about the 1980s. To be sure, there were sparks of innovation, like Mao's early National Missile Defense and the Manned Space Program, but the sector really didn't start to rumble until the 1990s.

The protest movement and then the violent crackdown during Tiananmen, plus the subsequent shocks of the fall of the Soviet Union, the First Gulf War, in my opinion, convinced the Chinese Communist Party that they had to build superior economic and military strength to defend their power position.

This is when the Party becomes serious about pushing People's Liberation Army reform to master ever-evolving high technology and to build the forces that will eventually be capable of opposing forces that might threaten the Party's core interests.

Indeed, the Party has ordered that there be a plan to build up its aerospace sector to build modern, superior military and civilian aerospace capabilities, and more recently, to build the capability to compete in the global aerospace marketplace.

This plan is largely led by the PLA, in my opinion, but it includes many other bureaucracies and envelops most Chinese aerospace universities and departments.

During the 1980s, when the PLA had access to American and then European technology, there was some effort to reach out, some deals were cut, and others were not. Eurocopter probably established what is today the most enduring relationship from that period. Israel, perhaps the most profitable, up until early the last decade when U.S. pressure largely curtailed Israel's military technology contributions to PLA modernization.

From 1989 till the 1990s were dominated by access to Russian aircraft, weapons, transfer technology and design expertise. Behind them, the Ukrainians and then Israel. As regards true military technology, there has been little European and U.S. input, but on dual-use technology, in the last decade, there has actually been an increase in transfers.

China has sought to promote the development of a world-class aircraft industry through a series of reorganizations. It's not clear that these reorganizations have had as much impact on upgrades and

capability as that of the increases in capability by individual companies.

China's goal may be to create a smaller number of national champion companies, but it's also using the existing structure of companies which have so far resisted fundamental rationalization. This could change, but we have yet to see it.

There is one constant, however, and that is there is no division between military and civil realms of the aerospace sector. Party, of course, is the ultimate authority. Military is the second authority.

In the long-standing policies that have directed that the civil aid the military pervade in this sector as well.

So how has China's aerospace sector improved? First, it's been able to purchase and absorb modern design methods. Second, it has benefitted from the ability to develop new materials, composites, super-alloys, and then there has been a fundamental improvement in the ability to develop and use new electronic technology.

If there is an Achilles heel, it's in the aero-engine sector. So far there has been enormous effort, but I think we're just beginning to see real results. Engine design is as much an art as it is a science, and the Chinese have had a lot of trouble, but they apparently are now just beginning production of their first high-power military turbofan, the Taihang. A second turbofan based largely on a smaller Russian turbofan called the WS-13, or Taishan, may be entering into an advanced testing phase as well.

In addition, just last October, the Chinese revealed their first large high-bypass turbofan for their large civilian airliner. It's called SF-A. At the time, they released a little information about this high-bypass turbofan. Apparently, it's been in development since 2001.

Now, I'd just like to briefly list what I think are some of the major accomplishments of the aerospace sector. Two fourth-generation fighters are now in production. I believe both will be upgraded to a four-plus level of capability in the next several years. By the 2020s, China could have over a thousand fourth generation fighters.

Second, in July 2009, Secretary of Defense Robert Gates told us that China wouldn't have any fifth generation fighters in 2020 and only a handful by 2025. That helped convince our Congress to end production of the F-22.

Then, in November of last year, a PLA Air Force Deputy Commander told a television interviewer that the prototype of their fifth generation fighter would fly, quote-unquote, "soon," and that it would enter service by 2017 to 2019.

I think we have to take this Chinese statement quite seriously. China may be testing its first carrier-based fighter. They've developed several types of AWACS in development and electronic warfare

platforms.

There may be a large bomber program underway. China's recapitalizing its trainer fleet, and it's looking forward, and it's developing a full range of surveillance and combat unmanned aircraft and is also developing platforms that the Air Force could use for counter-space missions.

In the civil realm, it's clear that China has learned many hard lessons from the last two decades and is following a Western pattern of developing a good airframe on which to insert Western engines and other Western components. This is how they've developed the ARJ-21 and are proceeding with the C919. There is also, in my opinion, a four-engine wide-body transport program.

So, in sum, as I see it, China is making progress. Their goal is to challenge the United States in terms of air, military air and civil dominance, and that's what we have to look forward to. And I apologize if I've exceeded my time limit.

Thank you.

[The statement follows:]

**Prepared Statement of Mr. Richard D. Fisher, Jr.
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Since the beginning of the latest phase of China's military modernization following the 1989 Tiananmen Massacre, the Chinese Communist Party leadership has striven to build a world class aerospace sector as a major element of increasing China's comprehensive national power. This goal has been pursued through enormous targeted investments in technology, design expertise, materials, and education, with successive sectoral reorganizations. A broad acquisition of foreign technology has been used to accelerate modernization and has been critical in all areas of success. Having set a goal to become militarily dominant in the realms of air and space, this decade will see the emergence of a modern Chinese 4th to 5th generation air force, their first large cargo transport aircraft, and potentially, their first commercially viable transport aircraft. However, reaching this point has also been hugely difficult for China and especially for its aero engine sector where results are just beginning to be realized. Assuming continued heavy government support and success, by the 2020s these capabilities could form a core military and commercial air power projection capability for China. Absent appropriate U.S. government and commercial investments, by the 2020s the U.S. military and commercial aerospace sector will find itself in an increasingly heated competition with China, which will have significant security implications for the United States.

By 1989 China's aerospace sector had largely just started the painful process of emerging from decades of dependence on Soviet 1950s era combat aircraft designs, a limited ability to produce indigenous 3rd generation combat aircraft, an inability to produce competitive commercial transport aircraft and an inability to produce modern aircraft engines. The aerospace sector also was organized in geographic clusters of aircraft and equipment factories reflecting "People's War" strategies, but producing inefficiencies like one factory's fighters unable to another's engines. By 2010, after nearly three decades of investment, reorganization, and acquisition of broad foreign technology, China's aerospace sector is well on its way to making China one of the top two or three global air and space powers by the 2020s.

China is now producing two 4th generation fighters which will soon be upgraded to 4+ generation capabilities, and a Chinese-made carrier-based fighter will soon emerge. These fighters are equipped with Chinese-made world-class precision air-to-air and ground attack weapons. China is now producing three types of airborne early warning and control (AWACS) aircraft and has one medium range tanker. China is also recapitalizing its trainer fleet with two new supersonic lead-in trainers, plus new jet and piston engine powered primary trainers. This decade will also see the emergence of a new C-17 size Chinese strategic transport aircraft.

It is increasingly apparent that since the early 1990s China has also been simultaneously developing a 5th generation combat aircraft, a prototype of which may fly in 2010 or 2011. Chinese aerospace officials hint it will be as capable as the U.S. Lockheed Martin F-22A. There are also hints of interest in smaller medium weight 5th generation fighters, raising the possibility of a Hi-Lo 5th generation fighter mix. China can also be expected to soon field a new array of sophisticated unmanned aircraft for surveillance and then unmanned combat missions. China also has one of the world's leading research and development sectors devoted to hypersonic aircraft, which may yield new platforms this decade. China is also offering new capable and bargain-priced aircraft and systems for export and co-production, which could soon offer strong competition at the low end of the market.

China's previous attempts at commercial aircraft, such as its 1970s failed attempt to copy the Boeing B-707, and subsequent failed attempts to co-produce or develop airliners with dominant Western partners, have given way to a much more serious Chinese-led effort to develop its own airliner industry, starting in earnest during the 10th Five Year Plan (2001-2005). To accelerate results China is actively seeking key partnerships with Western companies. Airbus, Bombardier and Embraer hope to secure market share in China by shifting major elements of airliner production there, but are also helping to improve China's aerospace workforce. While the ARJ-21 regional airliner may only meet modest success, China hopes emerge this decade as a major market player with its larger C919 airliner. Though it enters a crowded narrow body airliner market, China is betting that its deep finances, captive market and access to state-of-the-art foreign technologies will allow the C919 to gain a market foothold before major rivals Boeing and Airbus are able to offer their next-generation narrow body airliner. There is also a less examined four-engine wide-body airliner program from the Xian Aircraft Company which likely aimed at filling military requirements. China's helicopter sector also has received much greater investment, is realizing more programs, but it has yet to break a significant dependence on foreign design assistance.

If there is an "Achilles Heel" it would be China's aeroengine sector, which after sustained investments since the mid-1980s, may only now be starting to produce a suitably reliable 4th generation fighter turbofan. This achievement, however, is already fueling the development of multiple high-bypass turbofan engines for large aircraft. At the same time China seeks foreign partnerships which it hopes will better assist its ability to remain abreast of regent engine technology developments. A 5th generation fighter turbofan with a 10-to-1 thrust-to-weight ratio is also expected to emerge within several years.

Caveats and Sources

In the main this paper seeks to assess the progress made by China's aircraft sector from a hardware perspective, though many conclusions must be tentative. This is due largely to China's intense effort to deny or restrict a detailed level of data and insight about its military, information that has long been taken for granted in the West. For example, despite its official "declassification" in 2006, the People's Liberation Army Air Force (PLAAF) has only allowed two semi public opportunities for foreign military officials to get close to the new Chengdu J-10 fighter (November 2009 and April 2010). Chinese aerospace officials have yet to release a brochure of basic performance data for the J-10. Journalists are simply denied the degree of access to mid and top level aerospace official, or to factories, such as is

possible in the West. Western aerospace officials who work with Chinese companies also are often reluctant to comment on their future competitors, though China's Russian partners are sometimes more glib. China's major bi-annual airshow held near the city of Zhuhai has seen increasing restriction on information by Chinese authorities over the last decade. That said, the year 2009 witnessed some important spikes in transparency by Chinese standards, especially regarding new strategies, the 5th generation fighter program and large aircraft programs.

Nevertheless it is possible to reasonably discern many ongoing trends. The Pentagon's annual China Military Power reports provide a useful measure of Chinese aerospace trends but could easily be used to provide much more useful detail. This author and many other journalists and analyst have been able to mine the global airshow and arms show network for much useful information on China's aerospace sector developments. As China seeks to compete in global military and commercial aircraft markets it seems to realize the necessity of providing more data about its products. Web sites like *Scramble*, using tools like *Google Earth* and Chinese sources are able to assemble useful order of battle data. Nevertheless data about advanced military programs like their 5th generation fighters, hypersonics, engines, future aircraft weapons and new strategic aircraft programs remains heavily guarded. But Chinese themselves are among the most interested in these programs and there is a vigorous vetting of new imagery and data, however scant, on numerous Chinese military issue web pages and blogs.

Goals and Trends

China's leadership has set a national goal of creating a world class aerospace sector to fulfill both the requirements of dominating modern air and space combat and for creating competitive commercial aerospace companies capable of meeting Chinese civil transport needs and for competing in the global marketplace. In November 2009 People's Liberation Army Air Force (PLAAF) commander General Xu Xiliang described a new strategy for the PLAAF as building "an integrated air and space force capable of offensive and defensive actions." The emphasis on the Air Force building capabilities for space warfare was a new emphasis subsequently explained in Chinese state media as necessary for China to win future wars. This will require that China's aerospace sector is able to master 5th generation and 6th generation levels of military capability. Also, beginning in earnest during the 10th Five Year Plan (2001-2005), China has started the difficult and expensive task of building a commercially viable "civil" large aircraft manufacturing sector. Industry spokesmen have repeatedly stated that China must meet this goal if it is to be able to emerge as a leading global power later in this century.

Reorganization In the 1950s, consistent with People's War strategies that envisioned long guerrilla wars against invaders, China created an aerospace sector characterized by regional redundancy in order to ensure production of military aircraft. Major aircraft centers such as in Shenyang, Chengdu and Xian produced their own aircraft, engines and components but often one center's aircraft could not use another's engine. Due to the isolation of the Cultural Revolution and the 1960s Sino-Soviet split, China's aerospace sector remained relatively static due to political chaos, underfunding and lack of contact with new foreign technology. But these redundant centers also built political patronage networks to help ensure continued business.

Since the early 1990s it has been apparent that China's party and military leadership has been unhappy with the aerospace sector's inability to produce world-class products. There has been a pursuit of at times of the contradictory goals of achieving greater rationalization while also seeking to promote competition and innovation, which would require redundancy. In 1999 China organized its then about 440,000 aircraft sector employees into two large corporate conglomerates, placing most military and large aircraft concerns in Aviation Industries of China (AVIC) one and then putting trainers and helicopters in AVIC Two, with the goal of spurring greater domestic competition. AVIC, however, was a bureaucracy that

exercised control over still existing aircraft and component companies. The AVIC 1 Commercial Aircraft Corporation was an early attempt to combine distributed government and private factories and institutes toward the goal of making an airliner, the ARJ-21. Then in 2008 and 2009 there was a re-merging of AVIC 1 and 2, with a reported 420,000 employees and 100 companies, with some talk of the need to build new globally competitive “integrated companies.”

New organizations have emerged apparently to create a divide between military and civil products, but such separation does not seem practically or politically possible for China. In early 2009 AVIC Defense emerged, with a reported 60,000 employees, but with a new organization focused on advancing mastery of new technology but with apparent greater autonomy from the AVIC bureaucracy. However, AVIC Defense is also marketing the U.S. designed Cessna C-162 small civil trainer, which is co-produced by the Shenyang Aircraft Co. after a 2008 agreement. In early 2008 the Commercial Aircraft Corporation of China (COMAC) emerged, combining the former AVIC 1 Commercial Aircraft, Shanghai Aircraft Corporation and the First Design Institute for the goal of building competitive commercial airliners. However, a 2008 U.S. Institute for Defense Analysis study of a 2007 visit to the ARJ-21 airliner plant concluded that the former AVIC 1 Commercial Aircraft Co. was ultimately responsible to the Central Military Commission of the PLA. There are reports that individual aircraft companies like Chengdu and Shenyang have split into “military” and “civil” branches, but these companies remain united by a single leadership, and military and civilian assembly lines remain co-located, to ease the sharing of skills and technology. COMAC’s First Design Institute may also contribute to the design of China’s new large military transport aircraft. These reorganizations also will not change existing Chinese policies of “combining the military and civilian” to ensure maximum mutual benefit.

In early 2009 the AVIC Commercial Aircraft Engine Co. was announced with the initial goal of completing a large high bypass turbofan by 2016, currently called the “SF-A” first displayed in late 2009. It is now building a 30 hectare research and development facility in Shanghai, which indicates there is a potential for this new organization to actually relocate existing large aircraft engine expertise from major engine development centers in Chengdu and Shenyang, or to build a new engineer cadre. Military turbofan research and production remain at Chengdu and Shenyang, which likely have had longstanding large high-bypass turbofan programs. When put into production, the SF-A can be expected to enable military versions of new civil airliners, plus new large military transports and perhaps bombers.

Another organizational trend worth monitoring is an upgrading of commercial relationships between Chinese aerospace universities and aerospace companies. In early May 2010 it was announced that the Harbin Institute of Technology, famous for its contributions to China’s manned space program and for aircraft carrier design, signed an agreement to help the China Aerospace Science and Industry Corporation (CASIC) with five new laboratories to conduct rapid research. CASIC makes precision guided bombs, short range ballistic missiles and unmanned aerial vehicles (UAVs). While most Chinese aerospace universities and departments are heavily involved in government funded research for military programs, movement into formal military-corporate relationships may be a new trend. A more widespread teaming of universities and aerospace corporations may rebound to make both the universities and the companies far more competitive.

China’s aircraft sector has also been aided by a number of other trends:

Better design methods: In the early 1990s Chengdu and Shenyang benefitted from the hiring of Russian design consultants, whereas Chengdu had already benefitted from hiring Israeli design assistance for the J-10 program. Russian design assistance is still sought for various programs, to include engine design, though Russia has managed to protect its engine intellectual property better than for airframes. The Ukraine has been a source of consulting on large aircraft design and turbofan engine design. But China

received a real boost in the late 1980s when its aircraft companies started using CAD-CAM (computer aided design, computer aided manufacturing) and CATIA (computer aided three dimensional application) programs, at first from France. A Chinese source has noted that computer design programs accelerated the design of Chengdu's FC-1, which provided experience needed to radically reduce the development time for the twin-seat J-10S. Such programs are essential for China's distributed aerospace concerns to jointly develop and produce new aircraft, engines and other products.

New materials: Following global trends China has invested heavily in new materials to enable lighter stronger airframes and that allow higher temperatures needed for high performance engines. A recently released biography of a Chengdu Aircraft Co. designer explained how they developed initial composite materials for use in the J-10 and how they managed to hire a California-based laboratory to test their product. Composite material fabrication has also been an increasing part of the airline component production work that Airbus and Boeing have given to China. In early October 2009 X'ian Aircraft International acquired Austria's Fischer Advanced Composite Components, a major supplier of airframe and interior composite-based components. An ability to build large composite material airframes and skin of sufficient strength would contribute greatly improve China's ability to produce stealthy 5th generation aircraft designs, as well as modern, efficient civil and military transports.

Advanced electronics: The last decade has seen Chinese electronics companies absorb significant foreign technology which has aided their development of new advanced electronic components. In the 1990s the PLA was able to have some access to Israeli and Russian designs for radar for 4th generation fighters, which has aided the development of new Chinese radar for the J-10 and J-11 fighters. Access to Russian and Israeli active electronically scanned array (AESA) technology has likely accelerated China development of this critical technology for 4+ and 5th generation fighters and new radar aircraft. China has also quickly adopted technologies needed to create new digital cockpits that ease pilot workload and allow for better information networking. At the 2008 Zhuhai show China revealed a new large "data fusion" digital display similar to that used by the new Lockheed-Martin F-35 fighter. With Russian and perhaps some Israeli assistance China has also produced new optical/low-light/laser targeting pods to better use their new precision guided munitions.

Growing Engine Progress

Perhaps one of the most serious barriers to China's ability to build a world-class aerospace sector has been its heretofore inability to produce modern and reliable high-power turbofan engines for military and civil aircraft. That said, it is possible to detect that an enormous effort is underway and while China has experienced considerable difficulties along the way, it is a fact that progress is being made. However, as with so many other advanced military programs, China does not allow the dissemination of sufficient data about specific engine programs to make clear determinations regarding their progress.

Military Turbofans Without an indigenous high-power turbofan China cannot enter into sufficient fighter production rates needed to rapidly recapitalize its fighter force to the 4th generation. Furthermore, it cannot sufficiently enable the sale of its 4th generation aircraft. As such, a great deal is resting on the success of the WS-10A or FWS-10 *Taihang*, China's first indigenously designed 4th (called 3rd) generation fighter turbofan, a product of the 606 Shenyang Aeroengine Research Institute (SARI) and the Shenyang Liming Aero Engine Group. A program reportedly started in 1986 by Deng Xiaoping, the goal of the WS-10A program was to produce a turbofan competitive with the Russian Saturn AL-31F and comparable U.S. engines to power new 4th generation fighters like the Shenyang J-11 and Chengdu J-10. It reportedly began flight testing on a J-11 fighter in 2002 and may have started low-rate production in 2006. A picture of the *Taihang* was revealed at the 2006 Zhuhai show, and a full scale engine was finally displayed at the

2008 Zhuhai show, though a full engine complete with exhaust nozzle was not displayed until the recent PLAAF 60th Anniversary.

Since the early 1990s Russian sources have disclosed to the author that Shenyang was experiencing great difficulties in meeting planned thrust goals, while there have been reports and rumors of other specific problems. In August 2009 a Chinese AVIC official admitted there were many problems facing the *Taihang* but declined to elaborate. Other possible issues include incidents of shedding turbine blades, oil leakage issues, and even one unconfirmed rumor of a new J-11BS fighter disintegrating in flight due to a *Taihang* engine failure. To be sure, U.S. engine makers were very challenged to make the leap from 3rd to 4th generation fighter engines, though at the recent November 2009 Dubai Airshow Russian officials conceded that given their large investment and commitment that China would eventually make the *Taihang* work.

While having kept a much lower profile, it is increasingly clear that the 624 Engine Design Institute, or the China Gas Turbine Establishment (GTE), and its related Chengdu Engine Group, may have competing advanced fighter turbofan engine programs. This was revealed with some surprise at the 2008 Zhuhai Airshow, when GTE revealed models of new fighter and trainer turbofans. One is a 9,500kg maximum thrust class engine, the other a 4,200kg maximum thrust class engine, and both appeared equipped with axisymmetric thrust vector control nozzles. These enhance extreme post-stall maneuverability and can improve short take-off and landing performance. This engine may be related to the more well known WS-13 program, or what is sometimes called the *Taishan*, which is ostensibly based on the Russian Klimov RD-93 turbofan that powers the MiG-29 and the Chengdu FC-1.

There are other indicators that Chengdu may have a large fighter turbofan development program. At the 2009 Moscow Airshow a Chinese AVIC official demurred when asked whether the *Taihang* would power the J-10 fighter. Then at the same show, Ukrainian officials explained to the author their hope to work with China, first to coproduce the Progress AI-222-25F turbofan for the Hongdu L-15 trainer, but then to co-develop a 9,500kg thrust engine and then a 15-ton thrust fighter engine. A Chinese source then suggested the AI-222-25F coproduction venture would fall under the Chengdu Engine Group.

It is also likely that there are programs underway at Shenyang and Chengdu to develop more powerful turbofans for 5th generation fighters. Chinese professional engineering journals show an interest in engines with a 10 to 1 thrust to weight ratio, thought to be a requirement for advance 15+ ton thrust engines needed for next generation fighters. One program is called WS-15 and is likely a program of the Chengdu Engine Group, though some Chinese sources say it is a Shenyang program. In mid-December 2009 an internet-source image of the WS-15 engine core appears, at least confirming this program's existence. A wall chart from the 2006 Zhuhai show illustrating China's fighter engine history noted the "4th Generation Aero-engine" to be a product of the "AVIC-1 Power Systems." In 2008-2009 AVIC was further reorganized resulting in the "AVIC Engine Group," which may promote greater cooperation among formerly competing engine groups. A Russian source recently stated that China is also developing a 18-ton thrust engine, which would exceed 40,000 lbs. of thrust and approach the 19.5-ton thrust Pratt and Whitney F135 engine of the F-35. China is unlikely to stop there. At the 2008 Zhuhai show a GTE official gave a rare interview in which he noted that the U.S. may be developing future engines with 16 to 1 thrust-to-weight ratios, implying they had to follow suit.

While having resisted the sale of its current advanced turbofan technology to China, Russia hopes to remain a source for completed advanced turbofans. In late 2009 a Russian source told the author that China is interested in the improved more powerful versions of the AL-31. For example, the AL-31F-M1 adds 1,000kg of thrust for a total maximum thrust of 13,500kg, and Russian officials note that future versions could achieve 15-tons of thrust. The PLA may make additional purchases of the AL-31FN if

Shenyang's and Chengdu's engine programs remain problematic. In addition the PLA is purchasing more Russian Klimov RD-93 engines to support the FC-1/JF-17 program with Pakistan. The more interesting possibility is that the PLA will continue to purchase Russian military turbofans as its indigenous engines come on line so as to sustain a higher rate of fighter production.

High Bypass Turbofans China is also apparently making progress in developing its own high-bypass turbofans for use in new large civil and military transport aircraft. At the 2008 Zhuhai show a mockup of the 3,200kg thrust "Minjiang" high-bypass turbofan, with potential application for business jets or UAVs, was displayed for the first time. It was reported to be a joint program of the GTE and the Shenyang Liming Aeroengine Company, another potential indicator of cooperation between the otherwise rival aeroengine groups. This engine may be used by business jet size aircraft. Then at the early November 2009 Shanghai Industry Fair the AVIC Commercial Engine Corporation made a surprise revelation of its new "SF-A" 12,000 to 13,000kg (@30,000lbs) thrust high-bypass turbofan, which one Chinese report noted had been developed in "secret" since about 2001. This engine may be ready for use by 2016 and is intended for use by the new COMAC C919 regional airliner.

The Chinese companies responsible for the SF-A have not yet been revealed. However, it has been oft reported that SARI was developing a high-bypass turbofan based on the engine core developed for the WS-10A. The prototype for this engine may be known as the FWS10-118, which also may be known as the WS-10D, a 12-ton thrust engine. This engine, or a purchased Russian Dvigatel D30-KP turbofan, or a co-produced model known as the WS-18, may power the new X'ian H-6K bomber. GTE's work on the Minjiang is a potential indicator that Chengdu may also be working on larger high-bypass turbofans. With the SF-A engine China hopes eventually to compete with the Safran/General Electric CFM-56 high-bypass turbofan family, one of the most popular regional jet turbofan engines with over 14,000 in service. This is a very ambitious objective, as China would also have to compete with the global sales and service infrastructures of well established turbofan makes CFM, GE, Pratt Whitney and Rolls Royce. But China is also planning to support the long-term development of its advanced high-bypass turbofan sector by developing several types of large aircraft that will provide a growing domestic market for its engines.

China is also going to try to keep abreast of continuous foreign turbofan developments. In 2002 AVIC chose the U.S. General Electric Company to produce a version of its CF-34 turbofan for the ARJ-21 regional airliner. But in late 2009 the new COMAC changed horses, selecting the CFM/Safan Leap-X turbofan for its C919 airliner, because it promised advances in fuel efficiency over the market-dominant CFM-56 turbofan and CFM agreed to accelerate its development schedule to fit the C919's timetable.

Military Programs

4th Generation Fighters China is now producing single and twin-seat versions of two 4th generation fighters for its air forces and now has over 500 4th generation and 3+ generation fighters and strike fighters. With a successful indigenous high power turbofan the PLA could likely double this number within this decade, but with improved 4th generation fighters. This represents a major achievement for China's combat aircraft sector despite the fact that both required major inputs of foreign technology and consulting, and both fighters currently rely on Russian-built turbofan engines. Both fighters employ modern effective weapons, use Chinese-built radar and may soon, if not already, start using a Chinese-built turbofan. Both fighters may also be upgraded with a Chinese-built active electronically scanned array (AESA) radar which would elevate them to a 4+ generation level. When so upgraded, they will likely be competitive with U.S. 4+ gen fighters like the Boeing F/A-18E/F *Super Hornet*, the Lockheed-Martin F-16 Block 60 *Falcon* and AESA radar equipped variants of the Boeing F-15C *Eagle*.

Though it took over 20 years of formal development the Chengdu Aircraft Corporation's canard-configuration (horizontal stabilizer in front) J-10 has emerged as China's first "indigenous" 4th generation fighter. In 2010 over 150 are estimated to be serving in about seven units. The single seat J-10A and twin-seat J-10S are comparable in size and performance to the F-16, which is not an accident as F-16 technology sold to aid Israel's *Lavi* fighter program of the 1980s, migrated to Chengdu when Israel was hired to provide consulting assistance on the J-10 program. A recently revealed early mockup of the J-10 built in 1991 shows it had the engine air intake of the Lavi/F-16. This was changed, however, when Russian consultants joined the mix in the early 1990s to integrate the Russian Saturn AL-31FN turbofan engine. The radar of the J-10 is assessed to have been influenced by Israeli and Russian technology, while a Russian active seeker makes possible the J-10's formidable PL-12 medium range AAMs. While there are few images of active J-10s carrying targeting pods and precision guided munitions, this capability is planned for the J-10.

At the end of 2008 Chinese reports emerged of a new variant of the J-10 testing at Chengdu, and images soon emerged of what is called the "J-10B," which has a redesigned engine air intake, a new infrared search and tracking (IRST) device and what may be a new AESA radar. Russian sources suggest that an early Russian Phazotron Corporation AESA radar sold to China in the mid-1990s may have formed the basis for the new Chinese radar. Some reports also suggest that the J-10B is primarily intended to meet a requirement from Pakistan. These modifications point to the J-10 having evolved rapidly toward a 4+ generation level of capability. In 2005 a Russian estimated for the author that China might build up to 1,200 J-10s over its lifetime, while in late 2009 another Russian source stated that so far 300-400 AL-31FN engines had been purchased to support J-10 production. It is expected that Chengdu will integrate a version of the WS-10A *Taihang* turbofan into the J-10, while Russia hopes to sell more powerful versions of the AL-31FN.

One of China's first major post-Tiananmen military purchases was its initial batch of 36 Sukhoi Su-27SK single-seat fighters delivered between 1992 and 1996. In the few times they have met in mock combat, the Su-27 and Su-30 have outperformed the U.S. Boeing F-15C, though the latter has had advantages in electronics and weapons. Its first experience with a world-class 4th generation fighter, the PLAAF's absorption of this fighter was not without difficulty. However, by 1998 the PLA felt confident enough to secure a co-production agreement between Sukhoi and the Shenyang Aircraft Co. for up to 200 fighters from Sukhoi-built components, designated the J-11. However, Russian glee at having secured such a large customer started to change dramatically by 2004. In 2000 a high Shenyang official told the author that they might not build all 200 co-produced fighters, and it turns out that only about 100 kits were indeed acquired from Sukhoi.

To the Russian's then and ongoing dismay, the PLA's real goal was to appropriate the Su-27 design and with improvements put it into production. The J-11B emerged early in the last decade and reportedly started entering PLAAF units in 2007. In 2002 it was tested with the WS-10A *Taihang* turbofan but recent reporting and imagery suggests it may only by 2009 be equipped with this engine due to developmental difficulties. The J-11B improves upon the Su-27 design by using more composite materials to reduce airframe weight, a new digital cockpit and a better Chinese-made radar. In early 2010 a source suggested to the author that the J-11B is also being tested with an AESA radar, which would point to its quick evolution toward a 4+ generation capability. In 2008 it was revealed that the twin-seat J-11BS was in development and this is now in production. An estimated 140 Su-27s and J-11s serve in about seven PLAAF units. In mid-2010 internet source images of the Shenyang factory tarmac indicated that the PLA Navy Air Force (PLANAF) is now acquiring J-11B and J-11BS fighters for land-based units.

Chengdu's FC-1 lightweight fighter program is another important "4th gen" achievement for China's combat aircraft sector. It started in the 1980s as a Grumman-led program to radically upgrade Chengdu's

J-7 (MiG-21) fighter, which ended after Tiananmen, and was picked up by Russia's MiG in the early 1990s. The upgraded FC-1 design was revealed in 1995 and soon became a co-development program with Pakistan where it is called JF-17. It made its first flight in 2003 and an upgraded version entered Pakistan Air Force service in early 2010. The FC-1's main attraction is that it offers about 80 –to-90 percent of the F-16's performance for about a quarter to one-third the price. It also features a useful radar, digital cockpit and can use 4th generation AAMs and precision guided ground attack munitions. Pakistan may build up to 250 and many countries are interested in buying or co-producing this fighter, which has no real market competitor from Russia or the West. The PLA, however, has not yet purchased the FC-1.

5th Generation Fighters On July 16, 2009 Secretary of Defense Robert Gates told a Chicago audience that China “is projected to have no 5th generation aircraft by 2020,” and only a “handful” by 2025. This argument was used to help convince the U.S. Congress to end production of the Lockheed-Martin F-22 *Raptor* 5th generation fighter at 187 aircraft. So it was a surprise when on the November 8, 2009 edition of CCTV's program “Face to Face,” PLAAF, Deputy Commander General He Weirong stated that China's 4th generation fighter would fly “soon” and that this fighter could enter service in “about eight to ten years,” or between 2017 and 2019. General He is also reported to have said the planes in development “will match or exceed the capability of similar jets in existence today.” As this was the first detailed statement made by any Chinese official about its 5th generation fighter program, it has to be assumed that the PLA at least has confidence in General He's statement.

Just before General He's statement a widely cited but not confirmable Chinese Internet source stated that a prototype of the 5th generation fighter could start flying in 2010, albeit with a version of the 12-13-ton thrust WS-10A turbo fan in lieu of the not yet ready 15-ton thrust engine. This source also noted that China could acquire up to 300 of these fighters. Reportedly these fighters will have a “4 S” capabilities: stealth, super cruise, super maneuverability and short take off. After the March 2010 National People's Consultative Congress, Chinese aerospace officials were cited in some Chinese reports noting the goal is to make China's 5th generation fighter as capable as the U.S. Lockheed-Martin F-22.

China's 5th generation fighter program may already be twenty years old. According to the apparent memoir of a former 611 Aero Design Institute member, in 1989 China started organizing conceptual studies for its “next generation” fighter. Both the Shenyang Aircraft Co. 601 Aero Design Institute and the Chengdu Aircraft Co. 611 Aero Design Institute were then appropriated work in the “2-03” Program.

Beyond this public data about the 5th generation programs at Shenyang and Chengdu is unsatisfactory. Both are thought to have been working on “heavy” twin-engine stealthy and highly maneuverable designs to compete with U.S. and Russian 5th generation fighters. However, Chinese internet sources, again unconfirmable, have suggested that in the PLA decided in favor of Chengdu's 5th generation design, giving Shenyang a subcontractor role.

Both companies are thought to have at various times tended toward a “canard delta,” with Shenyang first thought to be favoring a “triplane” design and perhaps later a triplane-forward swept wing. Chengdu has usually been associated with a twin-engine canard-delta design. A Chengdu 611 Institute brochure obtained around the November 2002 Zhuhai Airshow included a computer simulation design for an apparent heavy twin-engine canard-delta design which bore some resemblance to the aborted Mikoyan MiG 1.44 5th generation fighter prototype. Reporting from the time of this aircraft's unveiling in 1999 indicated some Russian interest in selling it to China, but there has been no subsequent reporting to that effect. There have been more recent indicators that both Chengdu and Shenyang have worked with 5th generation concept that starts with a flat delta shaped airframe core, to which are attached canard controls, wings and stabilizers.

There is also a possibility that China could have a program for other 5th generation fighters, perhaps to include a medium-weight fighter to compliment its reported heavyweight fighter program. In early 2005 a Chinese industry source told the author that the Chengdu Aircraft Co. was considering a “F-35 like” fighter program. That would have been a period during which Chinese defense concerns were finalizing their programs for the next Five-Year Plan to begin in 2006, but it is not known whether such a medium-weight fighter program was approved. However, at the November 2006 Zhuhai Airshow the Shenyang Aircraft Co. revealed a radical canard-triplane forward swept wing fighter design. But its compelling feature was that it had one engine, an indication that there may be a medium-weight 5th generation fighter program as well. By mentioning the Lockheed-Martin F-35, there is at least the implication that a potential Chinese medium-weight fighter could be built in multiple versions, to include a short-take off and vertical landing model (STOVL), much like the F-35B.

Aircraft Carrier combat aircraft Fairly soon China is likely to reveal its first fighter designed for its new aircraft carrier, now entering its final stages of refurbishment in Dalian. In 2009 Chinese sources indicated China may build four to six carriers. Since 2005 Russian sources have reported on discussions with China over reviving production of an improved version of the Sukhoi Su-33 to meet PLANAF carrier requirements. But in 2009 a Russian source disclosed to the author that discussions had not progressed due to China’s refusal to buy a profitable number of fighters. Since about 2005 Russia has been concerned over Shenyang’s effort to build its own carrier version of the J-11B, having obtained an early Su-33 prototype from the Ukraine in the late 1990s. At the end of August 2009 there was a spate of Chinese internet sourced reports, albeit unconfirmable, that a naval variant of the J-11B had started testing. With an AESA radar a naval J-11B would be very competitive with the F/A-18E/F, expected to remain the most important U.S. carrier fighter. It should also be expected that China will develop a carrier-based variant of its 5th generation fighter by the early 2020s.

Strike Fighters From 2000 to 2004 the PLA took delivery of 100 Russian Sukhoi Su-30MKK and MKK2 strike fighters for the PLAAF (76) and the PLANAF (24). This potent strike fighter gives the PLA a powerful multi-role fighter with an 8,000kg payload that in some air-to-air combat parameters is superior to the comparable U.S. Boeing F-15E *Strike Eagle*. Along with the Su-30 the PLA purchased many capable air-to-air and ground attack weapons, like the Vympel R-77 self-guided AAM and the Kh-59 medium range precision strike attack missile.

In 1998 the PLA was able to revive the X’ian Aircraft Corporation JH-7 strike fighter program, which dated back to the 1970s, when after the second effort, the PLA purchased full co-production rights for the British Rolls Royce *Spey* turbofan, now called the *Qinling*. A slightly improved version of the *Spey* was soon seen on upgraded JH-7A, which began to emerge in 2002. There are now about 180 JH-7As and earlier JH-7s serving in the PLANAF (five regiments) and the PLAAF (three regiments). The JH-7 carries the C-803 anti-ship missile, the KD-88 medium-range ground attack missile and with new Chinese-made targeting pods can use a range of Chinese-made laser and navigation satellite-guided bombs. While aerodynamically comparable to a larger 1960s vintage European *Jaguar* strike fighter, China now markets the JH-7A as a much less expensive alternative to the Su-30 and the F-15E. There are reports and some imagery that suggests X’ian is developing a stealthy JH-7B powered by a further improved *Qinling* engine.

China has yet to develop a new dedicated tactical close support fighter to succeed the 1970s vintage Hongdu Q-5, a radical development of the J-6, a copied Russian MiG-19. However, at the 2004 Zhuhai show it revealed the Q-5J, the first twin-seat version of the Q-5 for training, which heralded a major upgrade for a new single-seat Q-5 that can carry modern targeting pods for use of laser and navigation satellite guided munitions. Reports suggest that only 120 Q-5s remain in the PLAAF, which would be able to perform useful close air-support for possible conflicts over Taiwan or Korea.

Bombers Much like the continually modified U.S. Boeing B-52, China continues to develop new versions of the X'ian H-6 medium bomber, a copy of the venerable Russian Tupolev Tu-16 that first flew in 1952. This path was likely chosen in the early 1990s after Russia rebuffed early PLA attempts to purchase the supersonic Tupolev Tu-22M *Backfire*. The latest H-6K emerged in 2007, featuring a yet unknown but more powerful new turbofan engine that confers greater range. It also makes increased use of composite materials, has a new electro-optic targeting systems and a new digital cockpit. Most important it was configured to carry six new land attack cruise missiles on its wings, and possibly six more in its bomb bay. The H-6K is also likely be able to deliver new satellite-guided and laser-guided bombs. With its new engines the H-6K can likely reach Guam. Though subsonic and unstealthy, like the B-52, the H-6K's cruise missiles would pose a considerable threat to U.S. and allied forces and it could be used as aerial precision artillery after the suppression of enemy air defenses.

There is much speculation that X'ian is working on a new strategic bomber program, though there is no official confirmation of such. Apparently in connection with the November 2009 PLAAF Anniversary an internet image was released of what apparently was a model of a new large delta flying-wing four-engine bomber. It appears to be powered by four large high-bypass turbofans mounted external to the delta wing, which appears to be larger than the U.S. B-2 *Spirit* flying-wing bomber. It appears this design would not be as stealthy as the B-2 but it might have greater range and carry a larger payload. That said it cannot be verified from existing sources that this is a real PLA program. Nevertheless, its revelation during the PLAAF anniversary points to the prospect of a future high-tech PLA bomber program. If real, such a delta flying-wing bomber would give the PLA an intercontinental range nuclear delivery vehicle, or the third element of a nuclear triad along with land and sea-based nuclear missiles.

Advanced Weapons Following quickly from their stunning use during the 1991 Gulf War and then subsequent U.S. engagements in Kosovo and Iraq, the PLA has now developed its own advanced air-to-air weapons and has developed two families of indigenously designed precision-guided weapons.

In the 1990s the PLAAF acquired modern Russian aircraft weapons, and in 1993 was the first to introduce a helmet-sighted short-range air-to-air missiles (AAM) on the Taiwan Strait in the form of the Vympel R-73. Taiwan still lacks a helmet-sighted AAM, meaning PLA pilots can fire their missile well before non helmet sighted AAMs, basically guaranteeing victory. The U.S. Raytheon AIM-9X helmet display-sighted AAM was not deployed to U.S. Pacific-based squadrons until 2003. China's main AAM maker Luoyang is now developing a new next-generation highly maneuverable helmet display-sighted short-range AAM influenced by the South African Denel A-Darter short-range AAM. In late 2009 South African sources told the author that Denel did investigate cooperation with Luoyang but decided it would not be profitable and ended talks.

Russia has had a decisive influence on Luoyang's new PL-12/SD-10 self-guided medium-range AAM. As the PLAAF purchased Vympel's 75-km range R-77 self-guided AAM for its Su-30 strike fighters, it also managed to purchase an advanced AGAT missile guidance radar to form the basis for what quickly emerged as the PL-12. With new "lofting" programs, Western AAM experts estimate the PL-12's range may exceed 100km, which may make it very competitive with early models of the U.S. Raytheon AIM-120 AMRAAM. In 2008 internet imagery suggested that Luoyang may be developing a ramjet engine powered AAM, perhaps having purchased assistance from Vympel, which had an unrealized ramjet powered AAM program in the 1990s. If realized, such a ramjet-powered PLA AAM might be able to exceed 150km in range, which would allow the interception aircraft flying over Taiwan from well within the protective cover of Mainland-based SAMs. Such a ramjet-powered AAM would also present a great threat to critical U.S. AWACS and tanker support aircraft. The PLA also has the option of purchasing the 300km range Russian Novator A100 AAM now in development.

Beginning at the 2006 Zhuhai Airshow, missile makers Luoyang and CASIC have progressively revealed two new families of precision guided weapons. Both are offering laser-guided and navigation satellite guided bombs. The later likely can use U.S. GPS or Russian GLONASS navigation satellite signals, but soon will be using signals from China's COMPASS navigation satellite constellation. CASIC's "FT" series now includes the 100kg FT-5, which is analogous to the most recent U.S. Small Diameter Bomb (SDB) development of the revolutionary JDAM navsat guided weapons. Luoyang and CASIS bombs can also be fitted with strap-on wings to give them extended range. With their Su-30s the PLAAF also purchased several new Russian ground attack weapons like the Molniya Kh-29 short-range attack missile, the Raduga Kh-59 medium-range attack missile and the KAB series of optically-guided bombs.

Of some importance, Russia also sold the PLA the Raduga Kh-31A, a formidable ramjet-powered anti-radiation missile designed to target radar and other electronic emitters, like AWACS. Early in the last decade reports and images emerged of a Chinese copy of the Kh-31, called the YJ-91. Raduga officials, however, consistently denied selling co-production rights. An Asian military source explained to the author that the YJ-91 takes the engine of the Kh-31 and adds a more effective Israeli aided seeker.

China has developed a new strategic air-launched land attack cruise missile, derivative of either the land-based DH-10 of the Second Artillery or the PLA Navy's YJ-62. Initially arming the new H-6K bomber this cruise missile likely will arm future bombers. Since the 1998 Zhuhai Airshow China has shown models of a new ramjet-powered anti-ship missile, similar in configuration to the French ASMP, but there was no confirmation of this program until mid 2009 when an Asian military source told the author it is in PLA service. If true this means the PLA now has a supersonic anti-ship missile with a possible range greater than 200km.

Trainer Recapitalization By early in the last decade the PLA embarked on a path to recapitalize its training fleet, concluding from hard experience gained during the 1990s that it required modern training platforms to prepare its pilots for new 4th generation fighters and all new aircraft dominated by digital cockpits. For trainers, new digital cockpits allow for rapid transitions to different training missions and greater scope for mission simulation. In 2010 the first CJ-7 piston engine primary trainer is expected to fly, the product of a 2006 agreement with Russia's Yakovlev to co-produce a version of the Yak-152K piston trainer. While the PLA reportedly will purchase 300, they will replace over 1,000 CJ-6 trainers. The Hongdu K-8 primary training jet was designed in the 1980s as a cooperative effort with Pakistan and U.S. engine maker Allied Signal, but the Tiananmen embargo forced adoption of the Ukrainian Ivchenko AI-25TLK turbofan, now co-produced as the WS-11. At first rejected by the PLA, after 2000 it was purchased to replace twin-seat JJ-5 trainers; about 400 are expected to be acquired for the PLAAF and PLANAF.

The PLA is also funding the development of up to five supersonic speed capable lead-in trainers. The PLAAF and PLANAF are buying the Guizhou JL-9, a less expensive turbojet powered trainer which takes the front end of Chengdu's FC-1, with a digital cockpit, but the back end of the old JJ-7 trainer, but with a new wing. Not yet ready for production is the Hongdu L-15, a twin turbofan powered trainer which likely must wait until its Ukrainian Ivchenko AI-225 engine enters co-production before being acquired by the PLA. Designed with assistance from Russia's Yakovlev, the L-15 appears well suited for development into a carrier trainer. The PLA also puts twin seat version of the Chengdu J-10 (J-10S), and soon, the Shenyang J-11B (J-11BS) into operational units to reduce the cost of training. Finally, in late 2009 a Pakistani source told the author that Chengdu will soon build a twin-seat version of the low cost FC-1 combat jet. In contrast the U.S. likely will not build twin-seat versions of the F-22 or F-35 fighters, relying instead on simulators for training, while struggling to commence a program to replace its continually upgraded 1950s vintage Northrop T-38 supersonic trainers.

Simulators are gaining increased usage throughout the PLA, and the PLAAF has long understood their value. The PLA has long been capable of producing modern full motion aircraft simulators and has also purchased simulator technology from abroad. Simpler desk-top simulators are also in widespread use in the PLA air forces. It should be expected that following on the U.S. example of increasingly networking military simulators to allow training by far-flung units about to be deployed, the PLA will make increasing use of similar simulator networking technology.

AWACs and EW Platforms China's ability to produce world-class electronic support platforms has come a long way from its first attempt in the 1960s to build an AWACs aircraft, the KongJing-1 (KJ-1), which sought to place a rotating radar on a copy of a Russian Tupolev Tu-2, itself a copy of the Boeing B-29 bomber. There are now about five AWACs programs alone plus multiple other electronic support aircraft programs underway. China has apparently mastered critical large active electronically scanned array (AESA) radar technology for AWACs, meaning they are a generation ahead of the technology used on U.S. Northrop-Grumman E-2 and Boeing E-3 AWACs.

During the 1980s and 1990s there were multiple attempts to acquire foreign AWACs technology. Britain's Marconi apparently sold at least one example of its *Argus* radar from the cancelled *Nimrod AEW* program, which China placed on a modified Russian Ilyushin Il-76 transport. Then in the mid-1990s Britain's Racal Co. sold six of its *Skymaster* lightweight naval airborne early warning (AEW) radar, which still fly on the PLA Navy Air Force's Y-8J aircraft. Ostensibly sold to help China "combat piracy," by 1999 the Y-8J was observed in exercises providing long-distance cueing for ship-launched anti-ship missiles.

Perhaps the most well known foreign influenced AWACs program is the KongJing-2000 (KJ-2000), which placed the Elta/Israeli Aircraft Industries *Phalcon* fixed active electronically scanned array (AESA) radar on a Russian Beriev A-50, itself a highly modified Il-76. Even though by mid-2000 President Bill Clinton had personally intervened with Israeli Prime Minister Ehud Barak to cancel this sale, the PLA Air Force now flies four KJ-2000s. An Asian military source disclosed to the author that KJ-2000's radar signature is the same as the *Phalcon*, an indication that despite U.S. intervention, China found alternate means to complete this program. Part of the U.S. alarm at the *Phalcon* sale was the transfer of then state-of-the-art AESA technology which the U.S. was just discovering could be used as a weapon by focusing intense electronic radiation on vulnerable electronic components. In addition, AESA radar are highly difficult to jam and can passively monitor electronic intelligence at ranges greater than active detection.

A second less expensive Chinese AESA AWACs platform is the Shaanxi KJ-200/Y-8W, which uses a "balance beam" AESA radar very similar in configuration to the Swedish Ericsson PS-890 radar. Swedish officials have repeatedly told the author that there was no sale to China. Mounted on an improved Shaanxi Y-8 platform, the Y-8W operates at a lower altitude than the KJ-2000 but has a potential 300km detection range. In April 2010 Japanese Air Force fighters intercepted a Y-8W operating over the East China Sea. There are about five Y-8Ws in the PLAAF and the PLANAF reportedly will purchase this AWACs to replace or supplement the Y-8J.

A third AWACs program is called by some sources the ZDK-03, uses a rotating radar array and is due to be delivered to Pakistan's Air Force in 2010. There may also be multiple airborne radar programs underway for the PLA Navy Air Force. In late 2009 internet sources revealed that a version of the Changhe Z-8 helicopter was being tested with a retractable radar that in flight rotates below the fuselage. There is speculation this will be the first AWACs support platform for the PLA's first aircraft carrier. In 2005 a Chinese magazine carried a photo of a politician visiting an aircraft design bureau and also seen was the partial image of an apparent fixed-wing turboprop powered AWACs aircraft similar in size to the U.S.

Grumman E-1 *Tracer*. Then a 2009 journal article from China's Northwestern University featured a wind tunnel study of a Russian Sukhoi S-80 twin-boom turboprop with "saucer" and "beam" radar configurations, suggesting an alternate future AWACS for Chinese aircraft carriers.

The improved Y-8 also serves for other electronic warfare and support missions. In 2005 the Y-8G was revealed to feature two large cheek arrays on the forward fuselage, which could house a phased array antennae for electronic warfare or jamming missions. Soon after the Y-8T was revealed as a dedicated airborne command and control aircraft, to serve as a supplementary command post. Earlier versions of the Y-8 serve as electronic warfare platforms for the PLAAF and the PLA Navy. In addition since 2007 the PLAAF has equipped some of its early Xian JH-7A strike fighters with dedicated electronic warfare pods, which likely allow it perform jamming escort missions similar to the U.S. Boeing EF-18F *Growler*.

Maritime patrol and anti-submarine (ASW) patrol aircraft are categories of combat aircraft in which the PLA remains lacking compared to other major air powers. In the middle of the last decade there were Russian reports of PLA interest in purchasing the very long range Tupolev Tu-142 strategic ASW aircraft but this has not been realized. The PLANAF relies on a small number of Shaanxi Y-8s modified for maritime patrol, while the PLA also sends electronic intelligence, and more recently, Y-8W AWACS on patrols over the East China Sea. At the 2000 Zhuhai airshow AVIC unveiled in model form its Y-7MPA, a dedicated maritime patrol version of this twin turboprop airliner, but there are no reports it was built. Earlier in the last decade Russian reports persisted of Chinese interest in purchasing or co-producing the Beriev Be-200 twin turbofan-powered flying boat. Instead, at the 2008 Zhuhai show it was revealed that China was going to build an updated version of its old Harbin SH-5 flying boat, called the JL-600. By late 2009 Chinese reports emerged that construction had started and a first flight was expected by 2013. It will be built in fire-fighting, and can be expected to be built in maritime patrol and anti-submarine versions. The JL-600 will also greatly improve Chinese logistic support for its far flung outposts in the South China Sea.

Unmanned Aircraft Development The PLA's interest in unmanned aerial vehicles (UAVs) dates back to the late 1950s and has been dominated by university-based programs until just this last decade. Chinese universities like Beijing University for Aeronautics and Astronautics, the Nanjing University for Aeronautics and Astronautics and Northwestern Polytechnical University still play a key role in unmanned aircraft research and development but mainline corporations have radically increased their investment in this sector since the 10th Five Year Plan. The PLA's investment in unmanned technologies is not limited to aircraft, but encompasses ground vehicles, surface ships, submarines and robots ranging from single-purpose tractors to humanoids. But by the time the first U.S. large unmanned combat aerial vehicle (UCAV) enters service, likely something based on the U.S. Navy's Northrop Grumman X-47B, similarly sized PLA UCAVs may not be far behind.

In the 1960s China was able to acquire Russian Lavochkin target drones and U.S. Ryan *Firebee* reconnaissance drones captured over North Vietnam and China, to form the early basis for its early unmanned aircraft effort. During the 1980s China was able to obtain its next major UAV technology boost from Israel, which at the time was a world leader in tactical UAVs. At the 2000 Zhuhai show the Guizhou WZ-2000 was revealed, a squat twin-jet powered delta winged high-altitude long-endurance UAV, which by the 2002 Zhuhai show evolved into a medium sized UAV, which by the 2008 Zhuhai show appeared to form the basis for an armed turbofan powered unmanned combat aerial vehicle (UCAV) similar in size to the U.S. General Atomics MQ-9 *Reaper*.

Since the 2006 Zhuhai show there appears to emerged a rough division of labor, in which Chengdu and Guizhou concentrate on medium and long range surveillance UAVs and medium range UCAVs, while Shenyang appears to be concentrating on future long range subsonic and supersonic UCAVs. The 2006

Zhuhai show saw the revelation, in model form, of Chengdu's *Tian Yi*, which was revealed by internet sources in 2008 to have entered testing. While likely useful as a medium range UAV, the *Tian Yi* also serves to aid the development of Chengdu's *Long Haul Eagle*, which is close in size and configuration to the Northrop Grumman Global Hawk. In 2006 Guizhou revealed in model form its box-wing *Soar Dragon* UAV, credited with a 7,000km range, but there has been no subsequent information on this system.

At the 2006 Zhuhai airshow Shenyang created a stir by introducing in model form its *Dark Sword* supersonic UCAV, about which Shenyang has revealed very little. In 2006 it was described in a small plaque as a "fighter," which would have been an amazing accomplishment for a UCAV, though this mission was not mentioned in its plaque at the 2008 Zhuhai show. There has been some suggestion that this design may have been inspired by South African technical assistance. A new model of the *Dark Sword* was revealed as part of the 2009 PLAAF Anniversary, an indication that it remains an ongoing program. At the 2008 Zhuhai show the forward-swept wing subsonic *Warrior Eagle* was revealed, also likely a Shenyang program. This concept appears to be a more realistic goal technologically, if one considers it is well suited for attack and surveillance missions. Wall illustrations at the 2008 Zhuhai show suggested the *Warrior Eagle* would also be capable of cooperative "swarm" missions. There are also indications that the X'ian Aircraft Co. may be developing a strike UCAV.

PLAAF Space Warfare Potential While PLAAF leaders sought to justify active military space capabilities as part of their new strategy heralded as part of their 2009 anniversary, it is not clear that the Chinese leadership has chosen the PLAAF to be dominant "space combat" service for the PLA. Chinese sources have occasionally referred to a debate over which service to take that lead, to include the Second Artillery or the General Armaments Department of the Central Military Commission, which currently controls China's manned and unmanned space program. However, there are likely multiple PLA programs underway to achieve military combat goals in space that most likely would be controlled by the PLAAF.

The 2006 Zhuhai show saw the revelation in model form of the Air Launched Launch Vehicle, a space-launch vehicle (SLV) launched from an H-6 bomber that looks similar to the U.S. Orbital Sciences *Pegasus* air-launched SLV. Such an SLV would be much more flexible than the PLA's current SC-19 anti-satellite (ASAT) rocket. However, it is not known whether the ASLV has been developed. At the end of 2007 Chinese internet sources depicted the *Shenlong*, an apparent unmanned space plane technology test vehicle seen suspended for launch by a H-6 bomber. This program apparently was led by the Chengdu Aircraft Corporation, which earlier had been involved briefly in the 1980s with France's *Hermes* small manned space plane program. The *Shenlong* could form the basis for a reusable unmanned military platform similar to the U.S. Air Force's recently launched X-37B space plane, or it could serve to validate technologies for larger manned space planes.

At the end of 2009 some Chinese media reports on the new PLAAF strategy mentioned "reports" that China was developing a sub-orbital bomber. This raises the issue of China's apparent heavy investments in hypersonic (5x or more times the speed of sound) propulsion technologies, with the apparent goal of producing hypersonic aircraft for military missions. In 2007 Chinese engineers revealed that China has built a wind tunnel capable of Mach 5+ speeds that the Laboratory of High Temperature Gas Dynamics in Beijing. Also in late 2007 a Chinese internet image showed a wind tunnel model of a possible hypersonic test vehicle. Future hypersonic combat platforms could perform attack or reconnaissance missions from the edge of Low Earth Orbit.

There is also a suggestion that the PLA may be considering the arming of a large four-engine transport with a laser for the purpose of attacking satellites. An image released on Chinese web pages at the time of

the November 2009 PLAAF Anniversary, itself likely from a display to commemorate the anniversary, showed a new four-engine transport armed with a laser attacking a satellite. The PLA is known to have made great investments in military laser programs and it is not inconceivable that they would develop a large laser, perhaps a chemical laser, for use on a future four-engined transport known to be a program of the Xian Aircraft Corporation. While the U.S. has recently curtailed the Boeing YAL-1 laser-armed B-747 in part due to concerns the laser's short range makes it vulnerable for its anti tactical missile mission, such a large laser armed aircraft could conceivably perform an ASAT mission from protected airspace.

Large Civil and Military Transport Aircraft

Military transports China's ambition to build new large military and civil transport aircraft has been affirmed many times since the 2006 National People Congress meeting. On November 5, 2009 Chinese reports stated that during a press conference AVIC officials revealed that a mockup of a new 200-ton "military transport" aircraft would appear by the end of 2009. While this did not occur, it can be expected that during this year or next that AVIC will reveal more details on this large transport. In 2006 Ukrainian officials noted they had been hired as consultants by X'ian Aircraft Design and Research Institute (603 Institute) to consult on large aircraft programs, to include the possible adaptation of Antonov's turbofan-powered An-70 for turbofan propulsion. Then in 2007 a Ukrainian official confirmed that images of a model of a Chinese four-turbofan military transport was another AVIC-1 design. It is not clear if the "200-ton" aircraft is the same as the AVIC-1 transport concept, but Chinese internet reporting has indicated this aircraft is designed to carry a 60-ton payload, which would place it in the same class as the Russian Ilyushin Il-76 and the U.S. Boeing C-17.

In addition, it appears that the X'ian Aircraft Company has made progress on smaller twin-turbofan powered high-wing transport, first revealed in model form at the 2004 Zhuhai Airshow as the "WJ" for Whoshan Jiaolian. It was described as a 50-passenger 20-ton aircraft for training. But in mid-December 2009 an image of a new model of this aircraft appeared, indicating the first example to have been built. This aircraft may eventually serve as a training aircraft, or this design may also serve as the basis for a reported larger 25-ton payload twin-turbofan medium transport slated to replace the turboprop powered Y-9 program. Such an aircraft would be competitive with the proposed Brazilian Embraer C-390 high-wing twin-turbofan transport, which is being developed for a 20-ton payload. Such an aircraft might allow X'ian to gain a leading position in an emerging medium-transport market for a more modern and faster replacement for the market-dominant turboprop-powered Lockheed-Martin C-130 Hercules (@2,300 built).

Civil transports Convinced that producing competitive large airliners is critical for goals of national power, China is now entering the highly risky and expensive civil airliner market. China can be expected to produce a family of airliners over the next two decades that will compete with most of the market segments now covered by Boeing and Airbus. China's COMAC can be expected to capitalize on the assurance of generous state funding, an ability to claim a sizable portion of an expected Chinese demand for about 3,000 new airliners, the ability to rapidly exploit new foreign technologies, and very likely, an attractive price. At the January 2010 Singapore Airshow officials from two Chinese airlines stated they would purchase the future COMAC C919 airliner. But as COMAC becomes a major competitor it appears that Airbus may have the better "hedge" to protect its share of the Chinese airliner market: the building of a final assembly facility for its A320 airliner in Tianjin.

China's ambitions to build a competitive civil airliner became serious in 2002 when AVIC announced its ARJ-21 65-90 seat regional airliner, which made its first flight in November 2008. To help ease market acceptance China has enlisted reputable global component suppliers: Antonov and Boeing for design consultation; General Electric for their CF-34-10A turbofans; Hamilton Sunstrand for the auxiliary power

unit; Rockwell Collins avionics; Parker Hannifin hydraulics; Liebherr for landing gear and Sagem for cabin systems. COMAC claims sales of 200, including the first foreign sale to Laos, and 60 for a leasing company owned by General Electric. One Chinese report notes the ARJ-21 could be sold for about \$28 million, which may represent a discount from a 2007 reference to a price of \$30 million. This is competitive with the \$35 million 70-seat Bombardier CRJ-700. Chinese leaders have pressed for rapid U.S. certification of the ARJ-21 as a means to build market confidence.

Before the ARJ-21 has proven itself in the market, COMAC has placed a much larger bet on its 80-ton 150+ seat single aisle C919 airliner, which will directly compete with the Boeing B-737 (6,000+ built) and the Airbus A320 (4,000+ built). It will also be competing with the Russian Irkut MC-21 and Canadian Bombardier C-Series, which like the C919 intend to quickly exploit new engines and technologies to gain market share from the B-737 and A320. The C919 is expected to fly by 2014 and enter service by 2016, powered initially by the new CFM Leap-X turbofan, which give a 16 percent fuel efficiency over the CFM-56 turbofan, and then by a version of the domestic 30,000lb thrust SF-A turbofan after 2016. Reportedly about 20 percent of its airframe will be made from weight and fuel-saving composite materials. While not as high as the 50-percent goal of the latest Boeing B-787 airliner, it is much higher than the older B-737 and A-320. Airbus officials have recently stated that a re-engined A320 can beat the C919 and other newcomers, but other analysts contend that without the new wing and lighter airframe of the C919 and its stable mates, Airbus and Boeing may have to invest in a next generation 150-seat class airliner sooner than a projected timetable of just after 2020.

Chinese companies and aviation officials have disclosed very little about a possible larger wide-body four-engine passenger transport program. The designation for this aircraft is unknown, but since 2007 occasional computer graphics and photos of models of this aircraft have appeared on the Chinese Internet. The most famous was taken at the end of 2007 at X'ian's Aircraft Design and Research Institute (603 Institute) during a visit by Premier Wen Jiabao, seen standing next to a partial view of the model. Subsequent photos of this model also indicate it a X'ian concept. This aircraft appears to be about the size of a Boeing B-767, or a 140+ ton max-weight airliner. An aircraft this size would likely obtain adequate power from four 13-ton thrust SF-A engines. The FWS10-118 turbofan is also linked to a 150-ton aircraft program, which would increase the possibility that X'ian's four-engine transport is a real program.

Powered by Chinese-made engines, both the C919 and the undesignated four-engine transport could also serve a range of missions for the PLA. The C919 could be adopted as a regional maritime patrol aircraft, similar in concept to the Boeing P-8 based on the B-737, or it could be outfitted with a linear phased array radar to fly at a higher altitude than the similarly equipped turboprop-powered Shaanxi Y-8W AWACS aircraft. The larger four-engine transport could be outfitted for long-range AWACS, electronic intelligence/attack and tanking missions, or as the laser-armed ASAT aircraft noted earlier in this article. A tanker version of this aircraft would provide a much more useful replacement for the smaller HU-6 tankers currently in use, and allow PLAAF transports, bombers and strike fighters to achieve global projection capabilities.

Helicopters

China's tragic May 2008 Sichuan earthquake quickly resulted in a critical spotlight on China's helicopter industry; China did not have enough helicopters to quickly meet urgent requirements and China's helicopter sector did not produce a heavy-lift (20-ton payload) helicopter like Russia's Mil Mi-26, one of which was hired to contribute to earthquake relief. There has since been a commitment to build such a heavy lift helicopter and Russia's Mil is likely to be the lead co-development partner, as it may be helping China with a less well reported 13-ton helicopter program.

While China has greatly increased investment and funding for its helicopter companies in the last 20 years, they have yet to break out a dependence on foreign design assistance and design inspiration. The heavy-lift helicopter program apparently will follow a long list of copied helicopters. During the 1980s the PLA established a strategic relationship with what became Eurocopter and now co-produces five Eurocopter designs: SA321 as the Z-8; AS565 Dauphin as the Z-9; AS350 as the Z-11; EC-120; and the EC-175 as the Z-15. The latest EC-175 is a state-of-the-art 7-ton class helicopter that uses advanced rotor and avionics technology. Previously Eurocopter officials would tell the author that China would not produce a military version of the EC-175 but in late 2009 Eurocopter officials stated that there was no impediment to China making military versions of the Z-15.

Eurocopter and Italy's Agusta provided design assistance for what has become China's first modern medium attack helicopter, the Z-10. About the same size as the Agusta A-129 and U.S. Bell A-1W attack helicopter, when produced in numbers it will provide effective tactical support for ground forces. There is some question over what engine the Z-10 will use; prototypes have been powered by Pratt-Whitney Canada PT6C-67C turboshaft, while reports note that Russian and Ukrainian engines have been tested on the Z-10. Reports also suggest the Z-10 will use a less powerful but indigenous WZ-9 turboshaft. It is armed with the HJ-10 anti-tank missile that is similar to the U.S. *Hellfire*.

Russia has sold about 200 of its Mil Mi-8/17 family of 13-ton helicopters to the PLA Army and 18 of the Kamov Ka-28 naval helicopter to the PLA Navy. There are reports as well of program to co-produce the Mi-17 in China. Meanwhile China is benefitting from competitive pressures on helicopter makers to succeed in the China market, which has resulted in relaxations on previous Tiananmen restrictions on the sale of U.S. helicopters to China. For the future, Chinese sources suggest an interest in large tandem rotor helicopters while universities have studied tilt-rotor technology. China is also working on a number of unmanned helicopters from small size to sizes approaching the U.S. Northrop Grumman MQ-8 *Fire Scout*.

Conclusions

Despite a dearth of information on China's aerospace programs there is enough data to conclude that China intends to challenge America's current dominance of the aero-space realm. China is able to direct massive state resources toward this goal as it seeks to harness market forces and opportunities to its advantage. China's challenge is not just military but also commercial. While the 1990s showed China a difficult learning curve, by 2010 it can be said that China is nearing that curve in many respects and that this coming decade could prove a time of "harvest." China's 4th generation fighters will advance to 4+ gen levels of capability and initial 4-to-4+ generation level carrier fighters will enter service just before China's 5th generation fighters appear on the scene. China will also sell its modern combat aircraft to its rogue partners and to other states. As it is in other spheres, the United States is in a military airpower race with China. The prospect of the PLA building a force of over 1,000 4th generation fighters plus 300 5th generation fighters by the mid-2020s, with advanced weapons and support aircraft, has the potential to end the assurance of U.S. air superiority in Asia absent a vigorous U.S. response. As such, the 2009 decision to end production of the F-22 can only be viewed as incredible given U.S. reliance on assured air superiority for its military forces. The U.S. needs sufficient numbers of F-22s as it must now move quickly to lead the development of 6th generation air capabilities, UCAVs, hypersonics and energy weapons, if it is to sustain deterrence in Asia.

By the 2020s new strategic aircraft may also allow the PLA to combine new capabilities in maritime power projection with long-range strategic air force projection. The advent of a large intercontinental strategic bomber would tend to undermine the impression that China projects that it does not seek nuclear parity or superiority over the United States and Russia. A large fleet of C-17-size transports plus the new

airmobile medium weight armor forces the PLA is building today will give China options for global rapid military maneuver.

China's commercial challenge is just starting but could accumulate rapidly. This experience too will not be easy for China. There will be the expensive challenge to build global support networks. There may also be market disruptions such as being denied Western markets and technology if China initiates military conflicts. Nevertheless, in the COMAC C919 China is betting for high stakes that it can succeed, with the West's help, to produce the first of many competitive commercial airliners. Major commercial producers like Airbus and Boeing have previously been united in their defense of policies that preserve their ability to sell to China. They also have invested in component production in China that in many ways helps China's ability to become a competitor. China's response to a potential challenge to COMAC by Western next generation narrow body airliners will be telling. Should China decide to use its large domestic market to rapidly expand COMAC's product line and then subsidize foreign sales, then it will be clear that it is aiming for commercial air dominance as well.

HEARING CO-CHAIR VIDENIEKS: Thank you. Dr. Cheung.

**STATEMENT OF DR. TAI MING CHEUNG
SCIENTIST, INSTITUTE ON GLOBAL CONFLICT AND
COOPERATION, ASSOCIATE ADJUNCT PROFESSOR, SCHOOL
OF INTERNATIONAL RELATIONS AND PACIFIC STUDIES,
UC SAN DIEGO, CALIFORNIA**

DR. CHEUNG: I would like to thank the Commission for inviting me to testify.

The title of my presentation is what I call "Remaking Cinderella: The Nature and Development of China's Aviation Industry." And China's aspiration is to turn from Cinderella into the belle of the global aviation ball. And what I try to answer in my testimony is, is this a fairy tale dream or a realistic proposition?

I have three objectives in my testimony:

One is to provide a brief overview of the development of the Chinese aviation industry over the past decade.

The second is to look at some of the long-term trends as spelled out in some of their official development plans.

And then, third, to assess where the industry stands in the innovation order itself. And I'll spend a little bit more time on the last one.

So given a brief overview of what's been going on in the last decade, which I see as, I would define as the renaissance decade, in which the Chinese aviation industry after going through prolonged stagnation and isolation in the '80s and '90s and previously, it began to adopt many of the successful reforms from the civilian economy: corporate restructuring, especially of AVIC; significant revamping of the R&D apparatus and the processes involved; bringing in reform-

minded leaders and specialists.

All of this then led to some very impressive improvements in key performance indicators, and we look at three in particular.

In profits, while we may discount some of the numbers, what we do see is that there's been this record rise in profit levels in AVIC and across the aviation and defense industries over the last seven years.

Innovation rates and resources like patents, R&D spending, the development of research laboratories, et cetera, have been growing as well.

And, of course, as Dr. Fisher mentioned, there's been expanding lineup of new products, but of course, a lot of this comes from a very weak base, and there's serious structural weaknesses, including duplication and balkanization of the overall industry, and still very significant gaps in their R&D capabilities.

They've also then, on the second point, there's been also proliferation of development plans. There's at least five plans that I've been able to identify that defines the development of the Chinese aviation industry over the next five to 15 years.

Some of the key areas these plans address is, one, the step-by-step development of the civilian airliner industry, moving from smaller to less sophisticated, to primarily foreign-sourced products, over to larger, more localized products over the next ten to 15 years.

The boosting of civil-military integration, especially the leveraging of the civilian sector for military application. One of the key areas is financial and corporate innovation, opening up to the capital markets and shifting the burden of financing and investment from the state to the private sector.

And then also slowly shifting from purely domestic market to becoming a bigger international player, whether for exports or for mergers and acquisitions.

Now, what does this all mean for China's ability to achieve these goals? And so my third section looks at China's place in the innovation order itself. And when we examine innovation dynamics, I think it's useful to try to plot where the Chinese aviation industry is in terms of a five-stage ladder from imitation to radical innovation, which is what we often see when we look at the innovation literature, and China is what I would say is focused on the lower three rungs.

And the lower three rungs are imitation, incremental innovation, and architectural innovation. What these three rungs have in common is that the focus is on what we would call soft innovation capabilities that focus on organizational, management and process innovation, which is different from hard innovation capabilities, which is R&D, high levels of investment, skilled workforce.

So imitation has been the standard approach that the Chinese have practiced throughout its 50 to 60 years of history. Duplication, reverse engineering of foreign products, and they still do this. But they're moving beyond that, and now they're focusing increasingly on incremental innovation which is the updating of existing systems and products.

And they're also now moving into the third area, the architectural innovation, which is the changes in architecture of a product without changing its components. This focuses on systems integration and marketing.

The key issue is can they reach beyond these three rungs to the next two highest rungs, which is, one, modular innovation, and then at the very top, radical innovation. Modular innovation involves the development of new component technology, and this requires significant hard R&D capabilities, and the Chinese have shown significant weaknesses, and they have tried to avoid doing that in most areas, but they're beginning to do this.

We see it outside of the aviation sector, and we don't see a critical mass yet. And then in terms of radical innovation, which involves both modular and architectural innovation, this requires major breakthroughs across a broad range of technologies, and the only way to achieve this is through a broad-based, world-class, risk-focused R&D system, and the Chinese don't have all those components and capabilities yet.

And to be able to break through in like fifth generation fighters or wide-body jets, it's this area which they really have to achieve.

So right now, China can pursue some of these lower rungs of innovation, but I think it's still a long way to go for them to reach the very top rungs of the innovation order, and I'll end it there.

Thank you.

[The statement follows:]²

HEARING CO-CHAIR VIDENIEKS: Good timing. Thank you.
Sir.

**STATEMENT OF MR. PEDER ANDERSEN
INTERNATIONAL TRADE ANALYST FOR AEROSPACE, U.S.
INTERNATIONAL TRADE COMMISSION, WASHINGTON, DC**

MR. ANDERSEN: Thank you.

Chairman Blumenthal, members of the Commission, thank you for

² [Click here to read the prepared statement of Dr. Tai Ming Cheung](#)

this opportunity to discuss China's commercial aircraft manufacturing capabilities.

I'm appearing here today in my capacity as an aerospace and aviation analyst and not as a representative of the U.S. International Trade Commission. Any remarks I may make are my own and in no way represent the views of the U.S. International Trade Commission or its commissioners.

The civil aircraft manufacturing industry in China represents a significant opportunity for the world's aerospace supplier industry. China's central government has created its civil aircraft industry by rearranging its manufacturing assets in order to produce a large civil aircraft.

While the emergence of any new competitor represents a challenge to existing aircraft manufacturers, it also represents a new and growing market opportunity for companies that develop and sell parts and systems for these aircraft.

The opportunity has taken some time to mature. During the 1980s, through early '90s, China tried to develop a model based on exchanging market share for technology transfer to gain expertise in aircraft design, manufacturing and program management through joint ventures.

The first joint venture was with McDonnell Douglas in 1985 to produce a limited number of their MD-80 series aircraft. In 1992, a second joint venture between McDonnell Douglas and two Chinese companies followed, aimed at producing the newer MD-90 aircraft. Three were produced. After the program ended, China had failed to gain the core technology transfer it sought in areas such as aerodynamic and engine design, avionics and composite materials.

China subsequently approached two European aircraft manufacturers with hopes of forming a joint venture. China eventually linked up with Airbus and Singapore Technologies in 1996 to build a 100 seat aircraft, tentatively named the A31X. After further review, Airbus declined to pursue the program, and the project ended in September 1998.

In April 2005, China again approached Airbus seeking an Airbus final assembly line located somewhere in China. Ground was broken on May 15, 2007, in Tianjin, with an agreement on a final A320 series assembly line finalized in June of that year.

On May 11, 2008, China undertook a major reorganization of its aircraft manufacturing enterprises, establishing the Commercial Aircraft Corporation of China within AVIC-I to oversee the design and development of a domestic large civil aircraft.

COMAC, as it was known, moved away from the development

model that traded technology for market share, deciding to follow the systems integration model of aircraft development common among Western global large civil aircraft manufacturers.

This model allows for the procurement of parts and systems through open or global bidding for engines, electronic systems, and various parts of the airframe.

Although the systems integration model does not raise the design capabilities of the Chinese suppliers, it does enable China to produce an aircraft in a shorter period of time. Such an approach also increases the sales potential of the aircraft should the systems be similar to those already in service by the world's airlines.

Using this model, China imports nearly 40 percent by value of the parts and systems for their regional jet program, the ARJ-21. This model also has the potential to save money, largely through lower labor costs, as key components and subassemblies are designed and produced by suppliers rather than the aircraft manufacturer.

Recognizing the potential success of China's large civil aircraft program, Western suppliers, principally tier-one, have set up assembly and support sites in China. By attracting these Western companies, China will gain experience managing a global supply network and perhaps the basic knowledge of what it will take to sell to the international market--two business aspects not present in China's aerospace industries today.

The market for civil aircraft in China is relatively young, with ever-increasing demand for air travel services, particularly on domestic routes. This demand has created the need for several types of aircraft, including large civil aircraft, business jets, general aviation aircraft, and helicopters.

For reference, the growth in revenue passenger kilometers in China amounted to nearly 200 percent over the past decade while the global traffic grew by 37 percent. Both Boeing and Airbus have increased their sales of narrow-bodied large civil aircraft to China from about four to five percent of their total yearly narrow-body deliveries to 16 to 19 percent over the past decade. The demand for domestic passenger travel remains strong.

It is this demand for domestic air travel that has mobilized China's government to create a civil aircraft industry from its manufacturing infrastructure. Boeing predicts that through 2028, 70 percent of the large civil aircraft shipments to China will be for such aircraft at a cost of about \$280 billion.

This year alone, China will buy over 200 aircraft, a mixture of regional and large civil aircraft, according to the director of Civil Aviation Administration of China.

One reason for China to develop an alternate to a foreign large civil aircraft is to retain some of this money and any technological accomplishments developed during the program for its own needs. While the "cost of admission" to the world's large civil aircraft manufacturers group will likely exceed \$20 billion for China, there is a potential for both domestic sales and technological spinoffs from the program should it be successful.

The demand for civil air transportation services has also led China to establish three airlines who are charged with only using domestically-produced aircraft. These are Happy Airlines, formed in February 2008; Joy Airlines, April 2008; and the current Chengdu Aviation are examples of such airlines.

In addition, aircraft leasing companies have arisen in China and have begun placing aircraft globally. Leasing companies such as Bank of China's purchase of Singapore Aircraft Leasing Enterprise, Dragon Aviation Leasing Company Limited, and Shenzhen Financial Leasing Company Limited, all provide aircraft to airlines and might be a venue to introduce China's large civil aircraft to the market. These leasing companies would be a lower risk way for airlines to use domestically-produced aircraft when they become available.

Mr. Chairman, I look forward to discussing China's aircraft manufacturing industry and market for large civil aircraft.

[The statement follows:]³

PANEL III: Discussion, Questions and Answers

HEARING CO-CHAIR VIDENIEKS: Thank you.

We have some questions, and Commissioner Wessel is the first one.

COMMISSIONER WESSEL: Thank you all for being here and the time and effort you've taken to prepare your testimony and participate. We appreciate it.

Mr. Andersen, having read your earlier study--

MR. ANDERSEN: Thank you.

COMMISSIONER WESSEL: --which I'm deeply appreciative of as it creates somewhat of a baseline on the various issues that we're discussing as part of this panel and now your work is updating that. That's appreciated.

This is a huge economic issue for the United States. Aerospace is probably our top export performer, employs, as we heard from the Commerce Department this morning, at least 478,000 people directly

³ [Click here to read the prepared statement of Mr. Peder Andersen](#)

and all of the tangential, you know, the multiplier effects beyond that.

China's a non-market economy. In the true theory of comparative advantage, they would be buying our aircraft, they would be buying Embraer, you know, Bombardier, Airbus, et cetera, but they want to have their own indigenous platform. They understand, and we've all seen, you know, expectations that they'll need thousands of aircraft.

How do we respond to that? If we as a nation facing what we're facing now in terms of the economy want to maintain our leadership in what is a highly competitive area where we have a comparative advantage, we see China beginning to exclude us from their market, the ability to have three state-owned airlines that will, because they're not part of the Government Procurement Agreement, they will be able to only buy their indigenously-approved aircraft or produced.

We will be doing more through offsets to get, you know, the crumbs that are left on the table. How should we be exercising U.S. power, WTO rights, and any other remedies that might exist to be able to respond to these non-market forces or are we looking for new tools? Do we need new tools that don't yet exist?

MR. ANDERSEN: I'd love to have somebody else answer that.

[Laughter.]

COMMISSIONER WESSEL: You're speaking in your own capacity. We understand that, and again, this is an academic discussion. What kind of rules are there that we might be able to take advantage of? What are the limitations of those rules that we may have to look at some new remedies that don't yet exist?

MR. ANDERSEN: Well, I would say that if someone were to consider the WTO route, it is certainly a long and convoluted way to end up with a questionable result should you win.

I think perhaps a different tact than international policy is to maintain our technological edge, which I will guarantee you our companies intend to do as well as the European companies. They fully realize the possibilities inherent in China's growth in civil aerospace.

So I would just say that we should encourage our own domestic folks and support them hopefully through NASA. I just recall some statistic where our latest wind tunnel is going on 40 now, 40 years old, down in Tennessee. I think we could do a better job in supporting our own industry. I guess that's a simple answer.

COMMISSIONER WESSEL: Are we, though, confronted, and earlier from the Commerce Department--and the testimony was good in terms of addressing some of the challenges--but probably the principal one being a question of transparency, that, and as I believe you noted, COMAC was capitalized with a significant base, state money. There is expected to be \$20 billion or more that is going to be spent of state

money for launching this C919. No one knows beyond that what's going to be, what might have to be put in.

But Commerce talks about the inability to sort of disentangle the web that exists in China. When China was admitted to the WTO, they were supposed to address what their subsidies were and define them. Roughly ten years later, we're still trying to disentangle those webs. Do we have the tools to get at that, or do we need to make negative inferences as a result of the money that's being deployed and change the burden of proof, change the burden so that China has to prove that, in fact, that they are not preferential programs?

If they won't be transparent, how do we address our interests? I'll let you respond at some other point as I--

MR. ANDERSEN: Again, I'm sorry to say that I can't comment on what we might do through a WTO or policy action. I would agree with Ms. Saunders, it's extremely difficult--I want to emphasize that--to find out where the money goes. If it starts one place and ends up another, the trail in between would take, would take an awful lot of study, and we've tried. We came out with, the Commission came out with a study in December 2009 about the policies and various ways in which things are done, but it's so hard.

I would suggest that it might take somebody on the ground physically tracking or creating the trail because it's difficult from sitting in Washington to do that.

COMMISSIONER WESSEL: Thank you.

HEARING CO-CHAIR VIDENIEKS: Commissioner Wortzel.

COMMISSIONER WORTZEL: Thank you all for being here and for your written and your oral testimony.

Dr. Cheung, on page four of your written testimony, you have a short discussion of the 12th Five Year Defense Industrial Program being drafted. I'd be interested if you can talk a little bit about how a central long-term planning document like the 2006 15-year Science and Technology Plan gets prioritized and translated into R&D requirements that would support the People's Liberation Army in future defense requirements?

And how do the civil and military components of technology requirements in China get prioritized?

DR. CHEUNG: And we finish at 1:50; right?

[Laughter.]But I'll try to keep it shorter than that. Of course, this is all very much of a black box. They provide news announcements, especially the State Commission for Science and Technology and Industry for National Defense. SCSTIND is in charge of the 12th Five Year Plan.

They say it's now meeting and it's drafting, but they don't actually

provide the actual details. And this is the same for their Medium to Long-Term Defense Science and Technology Plan.

But the difference between the medium and long-term plan compared with these five-year cycles is that the medium and long-term plans focus on basic R&D and looks towards financing the long-term projects itself. So it plays a critical role in terms of defining the R&D priorities, which organizations are involved and where, and helping to shape what the funding processes are themselves.

This is very much of an integrated effort, which I think it's led by the General Armaments Department, but with significant roles played by COSTIND and now SCSTIND, as well as the various defense conglomerates.

One of the interesting things is that this has been a relatively new process. In the past, they've had a very disorganized and chaotic long-term defense R&D process. Now that they have these processes and organizational systems in place, you can see this reflected in terms of where the resources are and where they're able to get greater efficiency, in that way.

So, in many ways, it's a testimony that they're now thinking very systematically, and they're doing, and, again, the organizational systems into place, and it is reflected in terms of the various outputs, in terms of the innovation systems, in terms of their product outputs.

COMMISSIONER WORTZEL: Thank you.

HEARING CO-CHAIR VIDENIEKS: Dan.

HEARING CO-CHAIR BLUMENTHAL: Thanks.

Dr. Cheung, I really liked your typology of different forms of innovation and where the Chinese seem to be within each cluster, let's say.

You know, looking at, at least, the Chinese society is very large, and so it's hard to make any types of generalizations, but when you look at going up the innovation ladder into modular and radical innovation, China still because of its political and economic system, which is, parts of it are entrepreneurial and free-market based, but many parts of it are simply not. Political system, the legal system, and so on, would not seem to be conducive to that sort of innovation.

And then there are issues like traditionally hierarchical organizations that probably don't encourage too much risk and these sorts of things, and so I'm wondering, I really wonder if without major, major societal changes, both in terms of economic incentives and political incentives, as well as some of these traditional cultural issues inside Chinese organizations, they can get to that level of modular and radical innovation?

DR. CHEUNG: Those are very interesting and critical questions

and something that, it doesn't keep me up at night, but it makes me wake up and ponder. And these are, when we look at, in terms of political and economic issues itself, I think on the economic side and incentivization, the Chinese innovation system broadly, as well as the aviation and the defense sectors, they recognize that they need to change how you incentivize the innovators, the scientists, the engineers, the entrepreneurs, in particular, developing a robust intellectual property protection system, at least for their own domestic firms if not to help protect foreign firms going in, and they seem to increasingly get that.

If you look in terms of the development of the patent system, of patent registrations, that's going up, and they're really trying to beef that up because if you don't do that, companies are not going to be in their interests to pursue this.

On the political side, from a lot of the academic assessments that have taken place, not just on China but over other countries, the issue of the political system in terms of whether it's authoritarian, et cetera, it doesn't seem to play as big a role in being an obstacle or an accelerator to innovation itself. It plays a secondary role.

What is more important, when it comes to political issues, is in terms of is the leadership invested? Are they willing to mobilize resources? And, in particular, in an authoritarian system, such as China, that has in many ways a more positive than a negative effect, especially as a lot of these projects, especially in the aviation sector, is what we call the "big science" approaches, and they're able to mobilize those types of capabilities.

And so in that way, that helps them to deal with and push along on some of these, on some of the lower rung innovations, but when we look at the very top rungs, the modular and the radical, it comes down to how they develop their hard R&D capabilities. Are they investing? Are they training these workforces? Are they developing these world-class universities, et cetera?

It seems that in those areas they are, and they are making progress in those areas. They've got a long ways to go, but they seem to be understanding what the ingredients are.

HEARING CO-CHAIR BLUMENTHAL: But let me just--you can't just create a Silicon Valley. I mean that's a culture. That's a deeply imbedded culture. It's part of American culture. So--

DR. CHEUNG: Right. So what they do is, so that's the market-based. So they are doing it in terms of the state-led, and they hope to nurture some small part so they have their equivalent of Silicon Valley.

HEARING CO-CHAIR BLUMENTHAL: Isn't that a contradiction in terms, "the top leadership is trying to nurture a culture like Silicon

Valley"? I mean that seems completely backwards in terms of the model of--

DR. CHEUNG: But it's a very big S&T system so there is key areas. On the strategic areas, they can nurture that, but in other areas, especially on the high tech and other technologies, those that are much more integrated into the global innovation economy, and you can see firms such as Huawei, et cetera, those from the bottom up, that is taking place, and they can seem to coexist.

So I don't think it's an either/or, and within the Chinese system, and the amount they're investing, and the wide areas, these different processes can and are coexisting and complementing each other.

HEARING CO-CHAIR BLUMENTHAL: Thank you.

HEARING CO-CHAIR VIDENIEKS: Related to this hard R&D question, I'd like to ask a question of Dr. Cheung. How big is PRC's hard R&D as a proportion of GDP, how does it compare to ours, and what have the trends been? Ours apparently is less and less. As a market model, it requires immediate profits in the short run. Obviously, R&D is a more longer-run consideration.

Now, I would say that efficiencies in autocracy would be to say, hey, do R&D now, and I want 1,000 Ph.D.s building the wing. Go ahead.

DR. CHEUNG: There are very good statistics on this, and in terms of its R&D as a percentage of GDP, China, in 2009, they spent basically 1.54 percent of their GDP on R&D. In 1995, they spent about 0.6 percent, and so they're rising up, and they have it in their medium to long-term plan that by 2020, they'll spend 2.5 percent.

The U.S. and other advanced OECD countries spend between three to four percent, and that is what you have to do to be an advanced country. So China is rising up, but it's got a long way to go, and it lags well behind the U.S. in terms of R&D and also in terms of the number of Ph.D.s and scientists and engineers per the population.

HEARING CO-CHAIR VIDENIEKS: Thank you, sir. Vice Chairman Carolyn.

VICE CHAIR BARTHOLOMEW: Yes. Thanks very much. Thanks to all of you for very interesting testimony.

I have a couple of different kinds of questions. My first one is while we're focused on aviation, we know that the Chinese government is forging ahead in other forms of transportation, including high speed rail, and there have been some interesting reports lately that high speed rail might be eating into or will eat into the Chinese aviation market. The railway stations are in the center of the city as opposed to airports that are 40 miles outside. It's cheaper, it's cleaner, and in some cases, it might even be faster, and I wondered, I guess probably for you, Mr.

Andersen, in particular, but I'd be interested in knowing from the others, if you have any sense yet of how much of an issue this might be?

MR. ANDERSEN: I think it's going to be a huge change. Once their system begins to run, I think high speed rail between city centers will absolutely take away from airlines that are currently going point to point. For all the reasons you mentioned. It's cheaper, faster. Cleaner as a secondary, I'm not so sure. But cleaner and faster, there you go. It won't take you two hours to get to the airport, another hour to get through security, and for a 40 minute plane ride.

VICE CHAIR BARTHOLOMEW: I just wondered, then, whether these estimates of how many planes we think the Chinese will be buying or producing over the course of the next 20 years will end up being off?

MR. ANDERSEN: I think the estimates are very accurate, to be honest with you. Because there is a demand for passenger service unlike any other place in the world. It just seems to be growing exponentially for domestic travel, not so much international. There are many parts of the country that are not served by regular air service at this point that will require more planes.

So anything that's displaced, there will be a market internally for those aircraft. They're building something like 26 new airports. They are pouring billions into aviation infrastructure throughout the country for areas that currently don't have that.

So the high speed rail will really be a complement to this service city to city, rather than an absolute means.

VICE CHAIR BARTHOLOMEW: Mr. Fisher.

MR. FISHER: Yes. Commissioner Bartholomew, the development of high speed rail, and there have even been reports about the Chinese being interested in linking high speed rail all the way to London, but it still will not obviate the need for large transport aircraft for international connections.

And the path that I see is one that is going to lead to, first, the C919, but then after that possibly a new four-engine wide-body airliner, and as I see it, the Chinese are very interested in next generation blended-wing body airliner designs. One of the primary pavilions at the new Shanghai Expo has this huge model of a blended-wing transport.

Boeing was trying to sell a blended-wing transport to the Air Force about five or six years ago as a means of jump-starting Boeing's ability to leap into that next generation of large transport aircraft, more fuel efficient, many advantages to them, but I see the Chinese focused clearly on the future, big airplanes, blended-wing body designs. They're going to go for it.

VICE CHAIR BARTHOLOMEW: Okay. Dr. Cheung, I have a different question for you, which is the Chinese government has--what--

\$2.3 trillion in foreign currency reserves. Maybe it's 2.5 by now, 2.6.

COMMISSIONER MULLOY: At least 2.5.

VICE CHAIR BARTHOLOMEW: \$2.5 trillion in foreign currency reserves. They clearly have quite a significant ability to buy up companies and assets around the world. If the Chinese government can buy what it needs in terms of technology or can steal it if it can't buy it, why does it matter if they can innovate themselves?

DR. CHEUNG: That's a fundamental question. You can buy the technology, but does that mean you understand it, and the Chinese have always had this problem. They've always had the saying. They often, they buy, they leave it on the shelf, they don't really absorb it as much, and they find out they have to go and buy again.

And one of the core sentences in their medium to long-term plan is they say innovation is the core lifeblood of a country, of their national security and national competitiveness.

If you have to buy, you're always going to be dependent, and you're going to be paying foreign scientists and engineers to continue to produce for that, and you're not sure what the international economic and security orders are, and they found through bitter experience, in 1960, in 1989, that the gates can be shut very quickly to your access, and those experiences have been very, very telling on them, and they're very, very keen that they must, they need to develop their own innovation capabilities.

And they also see this as a critical part of what they call their comprehensive grand strategy. If you don't have these hard R&D innovation capabilities, you can't really be regarded as a world-class sustainable power. So in terms of security, in terms of competitiveness, you need a homegrown indigenous R&D and innovation base.

VICE CHAIR BARTHOLOMEW: Thanks. If there is additional time, I'll ask.

HEARING CO-CHAIR VIDENIEKS: Go ahead. Mr. Fisher wants to say something.

VICE CHAIR BARTHOLOMEW: Mr. Fisher.

MR. FISHER: I'll try to add something briefly. I agree with Tai Ming in the main, but I would also add that there have been several instances, I believe, Tai Ming, in which the Chinese have demonstrated what I would assess to be considerable success in absorbing and then playing around and coming up with their own form of system, particularly the electronically-scanned radar, and moving into their own forms of large AWACS radar, and as they move ahead, 500, 1,000 fourth generation fighters, the imminent large 60-ton transport that they almost unveiled at the end of last year but will come along eventually.

Once they produce enough of those, they will have a capacity for

global projection, and that didn't require cutting-edge innovation to achieve, but they'll still get there.

DR. CHEUNG: I just have one definition, and this point keeps coming up, and that goes to what Rick Fisher said, it's indigenous innovation. We hear the term that the Chinese talk about, et cetera, but if you really want to know, I mean I define what Chinese call "indigenous innovation" as what we call "recombinationist innovation," which I think is an English term--but what they talk about is they combine both indigenous and foreign, and that's what they define as innovation.

So a lot is absorption, is opportunistic foreign acquisitions, but they blend it into their domestic capabilities, and in terms of indigenous, they want to increase that over the long term, but that's a long-term goal, and that's what we mean in terms of indigenous and combining foreign.

HEARING CO-CHAIR VIDENIEKS: Thank you, sir.
Commissioner Shea.

COMMISSIONER SHEA: I was going to ask a question about high speed rail as a fan of the Acela train and who uses it often. But Carolyn took my question, and it was a good one, Carolyn.

I'll just ask this question. Mr. Andersen, in your testimony, you state that China's central government had mandated that no new airlines would be formed before 2010 unless they fly domestically-produced aircraft.

Is that rule still in effect? And let me just ask you a series. Is that rule still in effect? And I know other countries, other Asian countries, Korea, Japan, I think Indonesia, have tried to produce their own domestically created civil aircraft, but is this type of policy [creating an airline to use domestically-produced aircraft] something--do they invoke this type of policy in their efforts, or is this sui generis, this policy?

MR. ANDERSEN: The first, to answer your first question, I don't know. However, given the financial situation around the world, not many airlines have started on their own. By the same token, sales of Western large civil aircraft to China haven't really slowed. In fact, 2009 was a banner year for deliveries.

Other countries who have tried to create their own civil aircraft programs have not, to my knowledge, also created this type of airline. It's something new, but there again, it's not surprising either because until their program, the C919 or, for that matter, the ARJ-21, has a track record, even the major airlines in China will not buy them in any numbers.

COMMISSIONER SHEA: Well, that raises another interesting

point. Explain to me--and anyone else in the panel--it's not just cost when it comes to airlines; right?

MR. ANDERSEN: No.

COMMISSIONER SHEA: You don't necessarily want to fly on the cheapest airplane; right? You want to fly on an airplane that has some positive track records. Could you flesh that out a little bit?

MR. ANDERSEN: Sure. It's often been said about the new aircraft programs, because countries have been talking for years about how they want a new civil aircraft, and they all focus on Boeing and Airbus as the target. Airlines are a lot more conservative. They know Boeing and Airbus aircraft. They know the standards of safety, of reliability, of maintainability, of support, that each of these companies bring to the table when they sell their product to their airlines.

A new entrant has none of these. It's a complete unknown, and unless the program, unless the, in this case, the C919, is markedly better than any Boeing or Airbus product, it's going to have a tough time selling outside of China. Domestically, they need planes so it will likely sell within China, provided that it is built to the same safety and level of maintainability [as Boeing and/or Airbus aircraft] and it receives the same support as a Boeing or Airbus product.

COMMISSIONER SHEA: Mr. Fisher.

MR. FISHER: There were two reports coming out of the January Singapore Air Show of major Chinese airlines, including Air China, saying that, of course, we'll buy the C919. Of course. So maybe they're trying to prove their patriotism.

But I see the 919 as an attempt at a very smart positioning in the market. They are trying to combine, as is the Russian MC-21 and the new Bombardier C Series, they're trying to combine advances in composite materials for lighter airframes with a new generation of slightly more efficient engines that could produce possibly a 15, maybe even a 20 percent advantage in fuel efficiency.

And they are betting that airliners will be very attracted to that, given high fuel costs, and are also betting that Boeing and Airbus won't get their act together for a competing next generation narrow-body airliner until the 2020s.

COMMISSIONER SHEA: Doctor.

DR. CHEUNG: To add, what the Chinese aviation industry, the commercial aviation airline industry, have to learn is that they have to apply by international standards to get people trusting in quality. And one of the key things they have to do to get certification is to get the FAA, and the FAA is playing a critical role to examine that, and if they don't conform to U.S. and international standards, no one is going to buy them.

The other point is that when they sell these airliners, they are overseas. They're going to be selling to the less-developed countries.

COMMISSIONER SHEA: They've sold to Laos; right?

DR. CHEUNG: To Laos and they sold to those other countries. So they're looking at a different market niche than the Boeings and the Airbuses of the world.

COMMISSIONER SHEA: Thank you.

HEARING CO-CHAIR VIDENIEKS: Commissioner Fiedler.

COMMISSIONER FIEDLER: A couple of factual questions, first, and some informational things. Mr. Andersen, since you've exhibited a pretty good memory, Commissioner Wessel repeated the number that Ms. Saunders used this morning of 478,000 people employed by the aerospace industry. What was it ten years ago; do you remember? More or less?

MR. ANDERSEN: A pure guesstimate would be six to 700,000.

COMMISSIONER FIEDLER: Okay. And she sort of was ambiguous about, she said it would hold and maybe grow if the economy bounced back or something like that. Do you actually believe that? Or do you expect it to go the other way?

MR. ANDERSEN: I would say I would have to agree with her, the reason being that the pie is getting larger. We need to ship more or deliver more aircraft.

COMMISSIONER FIEDLER: Okay. I'll pursue that with another witness who is coming this afternoon.

Now, I'm very interested in your combination of indigenous and foreign or foreign and indigenous. I want to take it in a slightly different direction. Do you know of anybody who studies Chinese patents to see how many of them are really combinations of foreign and indigenous? Just because something is patented doesn't mean it's legitimately patented.

DR. CHEUNG: There's a few people, but I don't know if they study it to the same type of extent to look at that. But there is that information out there. The Chinese State Patent Office discloses a lot of this.

COMMISSIONER FIEDLER: I'm talking about Western analysts of the technology. It has to be a scientist or an analyst.

DR. CHEUNG: I think they more do it in very large quantitative analysis rather than that.

COMMISSIONER FIEDLER: Yes. I don't think it's whether or not that stuff is stolen or not and tried to be patented.

DR. CHEUNG: Right, uh-huh, right.

COMMISSIONER FIEDLER: So that's an unexplored territory.

Mr. Fisher, do you know of a source where somebody has listed,

either in the open source sector or in the classified sector--what government agency is best--examples of U.S. tech transfers that have directly aided Chinese military aircraft industry? Or tech transfers as opposed to thefts? Because we hear a lot about tech transfers, but I mean is anybody tracking?

MR. FISHER: I know of no U.S. government publication that looks at this truthfully and through hard eyes since the Cox Commission.

COMMISSIONER FIEDLER: Is anybody in the private sector, open source, like, you know, academics, anybody look at it?

MR. FISHER: Two years ago, I wrote a piece about how the PLA is using American dual-use things, including Boeing aircraft, to assist their missile development program. So I've at least looked at the degree to which China is using Humvee, Humvee trucks, in the PLA, using Boeing and McDonnell Douglas cargo aircraft to assist in PLA transport exercises.

But to get beyond that, below that, to see what actual technology systems, part of an engine or part of an avionics package that somehow makes its way into a Chinese design bureau, I don't know.

COMMISSIONER FIEDLER: But don't we know, don't we know, don't some people know that in order to get to the next level technologically, you have to break a barrier, and that in order to break that barrier, you have to have achieved it yourself or bought it or stole it?

So in the terms of increasing Chinese military capabilities, aircraft capabilities, it seems to me that we can deduce they either did it themselves or they got it from somewhere else. And if they got it from somewhere else, it's not that difficult, it seems to me, to understand who does that?

And so I just don't understand why this isn't being done. Lots of charges get made regularly about tech transfers, but everybody is telling me there is no evidence. I'd prefer to have evidence before, you know, in order to recognize that there's a problem and not just an abstract esoteric one.

Yes.

DR. CHEUNG: One of the issues is that the Chinese have gone to the Russians so much that--and they've done it through legal and illicit means, and the amount of foreign technologies from that part of the world significantly transforming the Chinese aviation system I think far outweighs the episodic occasional transfers that they may get from the U.S. or other parts.

So you would have to distinguish the significant quantities of foreign technology assistance that they get from Russia, in the past from

Israel, or other parts, and it's like a--

COMMISSIONER FIEDLER: It's all known stuff though; right?

DR. CHEUNG: Well, even the Russians didn't know about the technology transfers until they got the--

COMMISSIONER FIEDLER: No, not the transfers, the fact that they have the technology. In other words, you are just raising a question of, oh, well, it's the Russians; it's not Americans. They stole the Russian's technology or bought it illicitly, but that doesn't obscure the fact that it was Russian technology that is the cause of the innovation.

DR. CHEUNG: It's not always that clear. I mean a lot of these technologies can come and then they have to recombine it. It's trying to find out where that is, and it's like--I wish it was easier, but often it's not that straightforward.

MR. FISHER: This is a lot of my dialogue with Russians at air shows, trying to figure out what, what piece of the new Chinese thing came from them or was sourced from them? Sometimes they understand. Sometimes they're willing to talk about it. Many times they're not.

COMMISSIONER FIEDLER: Okay. Thank you. I'm sorry I took too long.

HEARING CO-CHAIR VIDENIEKS: We're running short of time. Commissioner Mulloy has got a question.

COMMISSIONER MULLOY: Okay. Thank you, Mr. Chairman. Thank all of the witnesses for being here and your helpful testimony.

I have a first question for Mr. Fisher, but I hope the others will pay attention, and we'll build on that for a question for all of you.

Mr. Fisher, you opened your testimony by saying that, essentially since 1989, the Chinese Communist Party leadership has striven to build a world-class aerospace sector as a major element of increasing China's comprehensive national power.

What do you mean by "comprehensive national power"?

MR. FISHER: All elements of national power--military, civilian, driving high technology research, even innovation--as a means of propelling China into the future into higher levels of capability and so that the power position of the Communist Party can be maintained.

COMMISSIONER MULLOY: Okay. So it's both a military and civilian--

MR. FISHER: Yes.

COMMISSIONER MULLOY: --and maybe even financial and economic all tied together, their ability to project their power, and their industrial base and technological base helps them do that?

MR. FISHER: Yes.

COMMISSIONER MULLOY: Okay, then you say, quote, "this

goal of [building the aerospace sector] has been pursued through enormous targeted investments in technology, design expertise, materials and education."

Do other people agree with that point that I just made, that they're pursuing this goal, and this is one of the ways they're doing it?

DR. CHEUNG: Uh-huh.

COMMISSIONER MULLOY: Mr. Andersen, you add to this concept that it's not just they're putting their own money into it. You say on page two of your testimony that they also have "policies designed to attract foreign partners, as well as foreign direct investment, in the aircraft and parts manufacturing industry sector."

So they're pumping it in themselves, but then they're also attracting foreign companies, including American companies, to help them achieve these goals to achieve their comprehensive national power.

Is that what you see happening?

MR. ANDERSEN: I think my testimony had to do with civil aviation. I wasn't looking at their entire power projection capabilities. This is how they are developing a program. Since civil aircraft program comes along so rarely, about once every decade, every supplier has to bid on this program. It's just the way to stay alive.

COMMISSIONER MULLOY: Right. Mr. Fisher, do you agree that they're also attracting foreign investment as part of this effort?

MR. FISHER: Oh, yes, the systems approach to pursuing the ARJ and C919 programs are very clear. Yes, they are relying on top tier foreign component suppliers to more rapidly bring these aircraft to market.

COMMISSIONER MULLOY: Making these components in China?

MR. FISHER: I don't know what proportion of the components will be made in China, but I could, I am perfectly happy and prepared to speculate that that aspect which is not produced in China, they are certainly working hard to understand so that they can some day, in the not too distant future, make it themselves.

COMMISSIONER MULLOY: Okay. I just want to add one last thing. In your testimony, Mr. Fisher, you say that one solution, you say "absent appropriate U.S. government and commercial investments, the U.S. military and commercial aerospace industry will find itself in increasingly heated competition with China, which will have significant security implications for the United States."

So I think what you're saying is we have to put more money into R&D and helping our industry develop better. Is that correct? Is that what I read from that?

MR. FISHER: Absolutely, it is. As a matter of national defense,

we need to maintain this technology edge, and we need to be able to deploy that technology edge as quickly as necessary in order to sustain deterrence in Asia.

COMMISSIONER MULLOY: Here's the problem I have with all of that as a way. If we're pumping R&D into our companies and helping them achieve the higher technology growth, and then they're just transferring it to China in order to prove that they're a good partner of China, aren't we helping to fund the development of the Chinese aerospace industry with our taxpayer money?

Anybody want to comment on that question?

MR. ANDERSEN: Sure, I'll comment. I think there's maybe a slight semantic disjoint here. There's no doubt that we, the U.S., and Europe, European companies, will help the Chinese develop their civil aviation industry and their aircraft, their civil aircraft. However, just my guess is that they are either assembling parts domestically in China from either U.S. or European companies or the part is being shipped over from U.S. and Europe.

They are not designing. Their ability to understand the part itself is not automatic. A perfect example of that is the Airbus final assembly line where at the time there were 250 ex-pats there to bolt on the important stuff, whereas, the Chinese workforce constructed the plane under the watchful eyes of the Airbus, but in terms of the systems and the black box, if you will, that was Europeans who installed that in the aircraft.

I don't think we're helping them gain the same level as either U.S. or European manufacturers by selling them products off the shelf, essentially. This will absolutely help their industry, but at the same time, both the U.S. and European industries are looking at the next engine, the next system, the next aircraft, and this is how you have the 787. You had Airbus design the 330, which was more efficient than the 767. So Boeing comes back and leapfrogs that with a 787. This is how Western technologists have worked in the aerospace field.

They will leapfrog each other. For China to join the club is going to take significant amounts of not just money, but understanding.

HEARING CO-CHAIR VIDENIEKS: Mr. Andersen, that was a real good answer, in my opinion, to Commissioner's question.

We're kind of pressed for time. The Congressman is supposed to be here in a little while, and if we could thank you all for coming here today.

COMMISSIONER MULLOY: Mr. Chairman, Mr. Fisher wants to get one word in.

HEARING CO-CHAIR BLUMENTHAL: No, no. No, Pat, we don't have time. I'm sorry.

COMMISSIONER MULLOY: Okay. Thank you. Thank you all.
HEARING CO-CHAIR BLUMENTHAL: Thank you all very much for a great panel. Do you want to take a few minutes?
HEARING CO-CHAIR VIDENIEKS: Yes.
HEARING CO-CHAIR BLUMENTHAL: Take a five minute break and then convene the next panel.
[Whereupon, a short recess was taken.]

PANEL IV: CIVIL IMPLICATIONS FOR THE UNITED STATES

HEARING CO-CHAIR VIDENIEKS: Thank you, panelists.

The subject of this panel is commercial implications for the United States. The last two panels today will explore the implications of China's emerging commercial aerospace capabilities for the United States. In this panel, we seek to examine the commercial implications for the United States.

Joining us on this panel are two very distinguished witnesses. Our first panelist is Mr. Owen Herrnstadt, Director of the Trade and Globalization Department of the International Association of Machinists and Aerospace Workers, a position he has held since 1996. In this position, he is responsible for all international and trade matters affecting the IAM.

He is a member of the Council on Foreign Relations and serves on the U.S. State Department Advisory Committee on International Economics. He is also an Adjunct Professor of Law at the Georgetown University School of Law.

Mr. Elwell is the Vice President of Civil Aviation at the Aerospace Industry Association where he is responsible for activities on civil aviation issues and policy including the areas of environment, research and development, aviation infrastructure, safety and security.

Prior to working at AIA, he was Assistant Administrator for Aviation Policy, Planning and Environment at the Federal Aviation Administration. Mr. Elwell is a graduate of the U.S. Air Force Academy, and is retired from U.S. Air Reserve.

We, of course, look forward to hearing both of you, and we'll begin with Mr. Herrnstadt.

HEARING CO-CHAIR BLUMENTHAL: We may be interrupted at 2:15 by Congressman Bartlett, in which case we'll just ask your indulgence as he speaks, and then continue afterwards. Thanks.

HEARING CO-CHAIR VIDENIEKS: Thanks. Sir.

STATEMENT OF MR. OWEN E. HERRNSTADT

**DIRECTOR OF TRADE AND GLOBALIZATION, INTERNATIONAL
ASSOCIATION OF MACHINISTS AND AEROSPACE WORKERS,
UPPER MARLBORO, MARYLAND**

MR. HERRNSTADT: Thank you. Thank you, Commissioners, and thank you once again for the invitation to come before you.

It should come as no surprise that China intends to develop its own large commercial aircraft to compete with Boeing and Airbus. Few countries are as capable and as aggressive as China in building their own aerospace industries as we've learned from this past panel.

For many years, China has relied on transfers of production and technology from Western aerospace companies to develop its industry. At times, it also almost seems as if U.S. aerospace companies are only too willing to lend their assistance through outsourcing work in order to obtain market access and cheap labor costs that are often derived by China's failure to adopt and enforce international labor standards.

Boeing, Airbus, Bombardier, Embraer and other aerospace companies and their suppliers have procured parts and components from China valued at billions of U.S. dollars. Work for Boeing includes components for various programs. Airbus is operating an assembly facility for the A320 and just announced additional work involving wings.

Other aerospace companies are involved in China including jet engine manufacturers. Still other companies are involved in joint ventures in China producing lightweight planes. In addition, various aviation companies, airlines like United, have agreed to perform maintenance work in China.

The outsourcing of aerospace and related work to China poses a threat to U.S. aerospace workers and the U.S. industrial base in four different but related ways:

First, jobs that may be associated with the transfer of technology and production, and related aerospace industries like airline maintenance, are lost;

Second, the skills that accompany the transfers are lost leading to further decline in our industrial base;

Third, additional jobs could be lost in the future as China utilizes the transfer from the U.S. to create and strengthen its own aerospace companies that will compete directly with U.S. companies; and

Fourth, the technology and production that would have led to more U.S. jobs through the development of innovative products is also lost.

Policymakers should focus on ways to minimize the growing threat of China's aerospace industry on U.S. workers and our industrial base.

They can start with creating a framework that collects accurate and precise information regarding the number of U.S. jobs that are at stake due to China's growing aerospace industry.

To date, there is no comprehensive or methodical way to track commercial offsets or the transfer of technology and production, particularly in the commercial field.

Their analysis should concentrate on jobs that have been and will be lost through U.S. industry outsourcing and the transfers I've just mentioned. Policymakers should also insist that bilateral and multilateral discussions make the elimination of offsets in these transfers a priority, particularly when they are mandated by another government or a state-owned enterprise.

In addition, they must insist that China play by all trade rules, including respecting international labor standards and implementing proper currency valuation.

Given the amount of money involved with the large commercial aircraft program and other programs in China, and the number of state enterprises that are involved, questions regarding subsidies also should be looked at and taken very seriously.

Some skeptics dismiss alarms over China's growing aerospace industry. For them, China does not have the skilled workforce, technology and capacity to produce products of a quality to compete with U.S.-based companies.

Skeptics made that same argument years ago with respect to Japan, only to see the "made in Japan" label become actually sought after by consumers who believed it represented high quality technologically-advanced goods.

And 40 years ago, the notion that Europe would be home to one of the top two commercial aerospace companies in the world would have been hard to believe. Nevertheless, the skeptics remain, even though China has already met a significant test with the assembly of the A320.

As an Airbus official commented, "This A320 assembled in China unquestionably demonstrated the same quality and performance as those assembled and delivered in Hamburg or Toulouse."

Once again, I want to thank you very much for the invitation to appear before you, and I look forward to your questions.

[The statement follows:]⁴

HEARING CO-CHAIR VIDENIEKS: Sir.

STATEMENT OF MR. DANIEL K. ELWELL

⁴ [Click here to read the prepared statement of Mr. Owen E. Herrnstadt](#)

**VICE PRESIDENT FOR CIVIL AVIATION, AEROSPACE
INDUSTRIES ASSOCIATION, ARLINGTON, VIRGINIA**

MR. ELWELL: Chairmen Blumenthal and Videnieks and members of the U.S.-China Economic and Security Review Commission. My name is Dan Elwell, and I am the Vice President of Civil Aviation at the Aerospace Industries Association, the nation's trade organization representing the aerospace manufacturing sector with over 644,000 highly skilled employees, generating a trade surplus of \$56 billion per year.

Given that over 70 percent of all U.S. civil aviation manufacturing is exported, it's important for me to articulate the benefits of international trade with critical markets like China for our country, our industry, and the American men and women who manufacture the best aerospace technology in the world.

As you're aware, China is a growing and dynamic market for our industry. Last year, we exported approximately \$5.5 billion in commercial aerospace products to China and imported only \$406 million. In other words, we exported more than ten times what we imported from China.

To further put these figures into perspective, U.S. imports of Chinese civil aviation products represented 1.2 percent of our overall civil aviation imports.

Our companies estimate the potential civil aerospace market in China will be 3,770 new airplanes valued at \$400 billion over the next 20 years, a significant figure that does not take into consideration the potential aftermarket for parts and components to maintain those planes or the critical infrastructure needed to operate those aircraft safely and efficiently.

In the short and medium term, Chinese airlines will have to rely primarily on imported aircraft to meet their needs. Longer-term, the freedom to shop for airlines in other countries will lead to some gain of Chinese market share in contested export markets. But competition is increasing for everyone to produce aircraft that are safe, reliable, economically efficient and environmentally sound.

What global aircraft manufacturers, including China's, have all come to recognize is to pursue a "national jet" strategy that relies on a vertically-integrated supply chain completely within their borders instead of sourcing the best parts and components at the best price globally will not produce a competitive aircraft in the international marketplace.

In the end, winning export competitions in the Chinese marketplace for full aircraft as well as parts and components sustains

and grows the U.S. industrial base and its expertise in aviation design and development, production and component manufacturing.

Aerospace supplier companies of all sizes are considering joint ventures with domestic Chinese firms. The concern that such partnerships may represent an outsourcing of U.S. manufacturing capabilities in civil aviation is understandable but not credible in the short and medium term.

Competition in the global supplier base is fierce and geographically widespread, and there are high barriers to successful entry as a global player, a fact borne out, by the way, by trade statistics where established players dominate.

In the near and medium term, the business case for these joint ventures is best suited to capture market share within China rather than serving as an export platform. In the long-term, all global high technology companies can and do consider carefully the ramifications of transferring production know-how and other forms of their intellectual property through overseas joint ventures.

First and foremost, in the thought process, is how to protect their intellectual property and maintain both their short and long-term competitive advantage.

It is important to note that the highly specialized nature of civil aviation manufacturing means that no one company has the technical expertise to transfer technology in a manner that drastically affects the competitiveness of lower-tier suppliers.

In other words, if the U.S. customer of a U.S.-based parts and component supplier begins to locate production in China, the supplier has not assuredly lost its sales opportunities. The supplier may still have the business case to serve their customer from their U.S. operations, or even, as AIA encourages many members of our Supplier Management Council to consider, discover that they too can seek international partnerships to become an even bigger force in the global supply chain.

And speaking of technology exchange, it is also important to note that U.S. civil aviation companies undertake technology trade with China in strict accordance with U.S. export control laws and regulations.

U.S. aerospace companies partner closely with the U.S. government and Congress as advocates for strong and sensible export control policies and processes that assure protection against diversion of military or intelligence sensitive technologies while allowing legitimate nonsensitive exports to occur.

Having commented on the implications for U.S. civil aircraft and component manufacturers of developments in China, I now will comment

on the impact of China's expansion of maintenance repair and overhaul operations.

China's competitiveness in offering MRO services is constrained in a few ways, most notably by the operation of aircraft that have the range to go there for MRO work and the similar aspirations of many of their neighbors in the Asia-Pacific region. The market potential for aircraft operating in China cited earlier in this testimony is sufficient to provide many Chinese customers for Chinese MRO services.

In conclusion, it's readily apparent that China has significant potential to be a global leader in both supply of and demand for civil aviation products and services. I hope this testimony shows that given a fair and level playing field, in the near, medium and long term, we run a far, far greater risk of losing the growing and dominant U.S. share of the China market opportunity to other capable civil aviation manufacturers in the global marketplace than we do ceding our industry's global competitiveness to China itself.

Thank you.

[The statement follows:]

**Prepared Statement of Mr. Daniel K. Elwell
Vice President for Civil Aviation, Aerospace Industries Association,
Arlington, Virginia**

Chairmen Blumenthal and Videnieks, and members of the U.S.-China Economic and Security Review Commission: the Aerospace Industries Association of America (AIA) appreciates the opportunity to testify at today's hearing evaluating "China's Emergent Military Aerospace and Commercial Aviation Capabilities," and on this panel considering the implications for civil aviation manufacturing in the United States.

My name is Dan Elwell, and I am the Vice President of Civil Aviation at AIA, the nation's trade organization representing the aerospace manufacturing sector, with 644,200 high skilled employees generating a trade surplus of \$56 billion per year. Given that over 70 percent of all U.S. civil aviation manufacturing is exported, it is important for me to articulate the benefits of international trade with critical markets like China for our country, our industry and the American men and women who manufacture the best aerospace technology in the world.

As you are aware, China is a growing and dynamic market for our industry. Last year we exported approximately \$5.5 billion in commercial aerospace products to China and imported only \$406 million, representing over a \$5 billion aerospace trade surplus. To further put these figures into perspective, U.S. imports of Chinese civil aviation products represented 1.2 percent of our overall civil aviation imports.

Our companies estimate the potential civil aerospace market in China will be 3,770 new airplanes valued at \$400 billion over the next 20 years, a significant figure that does not take into consideration the potential aftermarket for parts and components to maintain those planes or the critical infrastructure needed to operate those aircraft safely and efficiently. China will attempt to address their prodigious need

for civil aviation products and services from both domestic and foreign sources. American aerospace products are critical and high-value components on every major commercial aviation platform and system in the world.

Aircraft

If we focus on the demand for airplanes, China developed the ARJ-21 regional jet, is developing the COMAC 919 widebody jet, and has an Airbus A320 final assembly line in Tianjin all aimed at supplying some portion of their domestic demand. In the short and medium term, Chinese airlines will have to rely primarily on imported aircraft to meet their needs. Going forward, it is important for those Chinese airlines' market competitiveness to continue enjoying the "freedom to shop" among the cutting-edge product offerings, as well as sales and service support of established general aviation, rotorcraft, regional jet, narrowbody and widebody manufacturers from the U.S., Europe, Brazil, Canada and future entrants into these increasingly crowded markets. Longer term, the "freedom to shop" of airlines in other countries will lead to some gain of Chinese market share in contested export markets, but competition is increasing for everyone to produce aircraft that are safe, reliable, economically efficient and environmentally sound.

The Civil Aviation Global Supply Chain

What these global aircraft manufacturers, including China, have all come to recognize is that to pursue a "national jet" strategy that relies on a vertically integrated supply chain completely within their borders instead of sourcing the best parts and components at the best price globally will not produce a competitive aircraft in the international marketplace. In this market environment, a proven track record matters and market share is not easily won by new entrants. Further, the highly technical, safety conscious, ever innovating, and deeply interdependent nature of the civil aviation supply chain ensures that demonstrated performance will more often than not trump price as the critical discriminator for buyers.

U.S. civil aviation parts and components manufacturers benefit from these market trends, but cannot take them for granted. Competition will be equally fierce at this level over time against a number of global players, including Chinese part and component manufacturers, for work on global civil aviation platforms, including those made by Chinese aircraft manufacturers. In other words, Chinese production of full aircraft represents one of many contested export opportunities for U.S. civil aviation suppliers in the years to come. In the end, winning export competitions in the Chinese marketplace for full aircraft as well as parts and components sustains and grows the U.S. industrial base and its expertise in aviation design and development, production and component manufacturing.

To produce viable, domestically produced aircraft, China needs to have access to these capabilities either within its own borders or through imports. The Chinese government would of course prefer the former to the latter. In developing these capabilities, China will consider a range of options to bolster the competitiveness of indigenous firms in both the Chinese and global marketplace. In this regard, AIA continues to support the position of the U.S. Trade Representative (USTR) that all countries involved in civil aviation manufacturing must have a level playing field with guidelines for such government support consistent with the obligations of membership in the World Trade Organization.

It should be noted China has observer status within the Agreement on Trade in Civil Aircraft (ATCA). Article 4 of ATCA states:

Article 4 - Government-Directed Procurement, Mandatory Sub-Contracts - and Inducements

4.1 Purchasers of civil aircraft should be free to select suppliers on the basis of commercial and technological factors.

4.2 Signatories shall not require airlines, aircraft manufacturers, or other entities engaged in the purchase of civil aircraft, nor exert unreasonable pressure on them, to procure civil aircraft from any particular source, which would create discrimination against suppliers from any Signatory.

4.3 Signatories agree that the purchase of products covered by this Agreement should be made only on a competitive price, quality and delivery basis. In conjunction with the approval or awarding of procurement contracts for products covered by this Agreement a Signatory may, however, require that its qualified firms be provided with access to business opportunities on a competitive basis and on terms no less favourable than those available to the qualified firms of other Signatories.

4.4 Signatories agree to avoid attaching inducements of any kind to the sale or purchase of civil aircraft from any particular source which would create discrimination against suppliers from any Signatory.

The U.S. civil aviation industry continues to observe Chinese procurement policies, such as the Indigenous Innovation procurement policy that favors Chinese government procurement from firms producing goods based on Chinese intellectual property. To date, such policies have not contravened the principles of ATCA.

Aerospace supplier companies of all sizes are working to increase their access to Chinese sales opportunities, and therefore consider joint ventures with domestic Chinese firms. The ideal state would be for this cooperation to be win-win – with the Chinese partner gaining some capabilities, while the western company secures long-term access to fulfill Chinese demand. China also encourages joint ventures with many of the same incentives as other countries to companies that are considering locating production facilities within their borders.

From an economic standpoint, the concern that such partnerships may represent an “outsourcing” of U.S. manufacturing capabilities in civil aviation is understandable but not credible in the short and medium term. Competition in the global supplier base is fierce and geographically widespread, and there are high barriers to successful entry as a global player (a fact borne out by trade statistics where established players dominate). In the near and medium term, the business case for these joint ventures is best suited to capture market share within China rather than serving as an export platform. Manufacturing in the civil aircraft sector is highly specialized and capital intensive, meaning that ramping up new production lines is not necessarily an easy or worthwhile task the higher up the value chain you go. As discussed earlier in this testimony, labor and other cost advantages are generally overcome by technical and quality factors. Organizing the time, effort and resources necessary to satisfy demand in China alone is a sufficiently complex task to occupy the production facilities of any civil aviation supplier doing business in China. Meeting all of China’s demand with indigenous or joint venture production alone is also not viable in the short or medium term, meaning export opportunities for U.S. companies will predominate.

In the long term, all global high technology companies can and do consider carefully the ramifications of transferring production know-how and other forms of their intellectual property through overseas joint ventures. First and foremost in the thought process is how to protect their intellectual property and maintain both their short and long-term competitive advantage. AIA does not take a position on specific corporate decisions, but in general AIA supports joint ventures because they advance U.S. technological leadership and increase the number of high quality American aerospace jobs through the growth of exports and market share.

Technology Exchange

It is important to note that the highly specialized nature of civil aviation manufacturing means that no one company has the technical expertise to transfer technology in a manner that drastically affects the competitiveness of lower tier suppliers. In other words, if the U.S. customer of a U.S.-based parts and components supplier begins to locate production in China, the supplier has not assuredly lost its sales opportunities. The supplier may still have the business case to serve their customer from their U.S. operations, or even (as AIA encourages many members of our Supplier Management Council to consider) discover that they too can seek international partnerships to become an even bigger force in the global supply chain.

Speaking of technology exchange, it is also important to note that U.S. civil aviation companies undertake technology trade with China in strict accordance with U.S. export control laws and regulations. U.S. aerospace companies partner closely with the U.S. government and Congress as advocates for strong and sensible export control policies and processes that assure protection against diversion of military or intelligence sensitive technologies while allowing legitimate, non-sensitive exports to occur. AIA member companies also regularly engage Chinese companies and the Chinese government on the rationale behind U.S. export controls, and the critical importance of maintaining compliance best practices in China as a prerequisite for sustaining the flow of appropriate, high technology trade with the United States.

Engagement and cooperation for capacity building in China has a proven track record of benefit on many levels to the U.S., as exemplified by the U.S.-China Aviation Cooperation Program (ACP). Launched in 2003 by the U.S. Trade and Development Agency (USTDA) and the Federal Aviation Administration (FAA), the ACP program was conceived as a counter to “EU Incorporated.” The European Union approach consists of joint European public and private sector coordination to engage the Chinese civil aviation leadership and promote European solutions to Chinese training, infrastructure and product needs. Through ACP programs, the Chinese have become increasingly familiar with the products and expertise of U.S. suppliers. To date, the nearly \$6 million in USTDA grants to the China ACP program can be linked to \$1.5 billion in exports of U.S. aviation equipment to China (\$720 million in 2009 alone). These export sales extend both to civil aircraft and related components as well as civil aviation infrastructure (e.g. China’s air traffic control system) designed to increase the capacity for more aircraft operating safely, efficiently and in an environmentally sound manner in the second largest aviation system in the world.

Maintenance, Repair, and Overhaul

Having commented on the implications for U.S. civil aviation aircraft and component manufacturers of developments in China, I now will comment on the impact of China’s expansion of maintenance, repair and overhaul (MRO) operations. China’s competitiveness in offering MRO services is constrained in a few ways, most notably by the operation of aircraft that have the range to go there for MRO work and the similar aspirations of many of their neighbors in the Asia-Pacific (e.g. Singapore, Malaysia, Vietnam). The market potential for aircraft operating in China cited earlier in this testimony is sufficient to provide many Chinese customers for Chinese MRO services. China has a good track record in aviation safety to date, but their air space will become more complex. FAA Administrator Randy Babbitt noted in a speech in Beijing last week that improved aviation safety and mitigating environmental impact in China are two areas “where we have not only a need, but an obligation, to cooperate.”

Conclusion

In conclusion, America’s future leadership in aerospace and other high-technology manufacturing industries will be derived from our unique ability to innovate and our drive to compete in global export markets. It is useful to consider that there was a time when similar concerns about U.S. civil aviation trade with China cropped up in discussions about civil aviation trade with Japan. Significant U.S. engagement and technology cooperation with Japan has resulted in dominance in that marketplace with

benefits that have accrued to the expansion of U.S. civil aviation capabilities and competitiveness. U.S. civil aviation companies have come to know that given the globalized nature of the civil aviation supply chain and the ever expanding number of market entrants into general aviation, rotorcraft, regional jet, narrowbody and widebody aircraft construction, there are both opportunities for cooperation and competition everywhere, more often than not in the same country.

Going forward, it is readily apparent that China has significant potential to be a global leader in both supply of and demand for civil aviation products and services. The potential demand certainly provides incentives for civil aviation manufacturers around the world to cooperate with the Chinese on their ability to compete as civil aviation suppliers. I hope this testimony shows that, given a fair and level playing field, in the near, medium, and long term we run a far, far greater risk of losing the growing and dominant U.S. share of the China market opportunity to other, capable civil aviation manufacturers in the global marketplace than we do ceding our industry's global competitiveness to China itself.

PANEL IV: Discussion, Questions and Answers

HEARING CO-CHAIR VIDENIEKS: Thank you both for your testimony.

Our first question is from Commissioner Wessel.

COMMISSIONER WESSEL: Thank you both for being here. This panel has an important impact on our economy in the sense that your industry is a leader of innovation, job creation and economic growth here. So we're very appreciative to have the opportunity to talk to you.

Mr. Elwell, you just said as your closing comment, given a fair and level playing field. Do you think we have a fair and level playing field with China?

MR. ELWELL: Yes, I do.

COMMISSIONER WESSEL: You do? So the discussion we had earlier from the Commerce Department about the subsidies that COMAC is receiving, now in the several billion dollar range, and that will presumably for the launch of the C919 reach 20 billion or more, that doesn't concern you as an association executive representing American producers?

MR. ELWELL: Well, China, as a signator to WTO, when the product comes out and is in the market, will have to answer to the same questions that the WTO presents to any level playing field question.

COMMISSIONER WESSEL: I'm not sure I understand the answer. We've been dealing with the trade and civil aircraft issues with the EU for ever since the Agreement in 1992 and still dealing with it with what I understand is the WTO case. The interim and final decision is coming.

Commerce Department talked about the inability to disentangle all of the various subsidies that exist in the Chinese market. With the lack of transparency, do you really believe we're going to be able to once

they enter the market be able to disentangle as well as address what have been tens of billions of dollars of subsidies by the time they actually field one of these aircraft?

MR. ELWELL: That's a forward-looking question so it isn't there yet.

COMMISSIONER WESSEL: Well, the subsidies have already been with COMAC--what was it--2.7 billion, if I remember, that was the original capitalization of state money. That's not a forward-looking issue; that's a here and now. The ARJ-21 is being fielded, and they have already orders for those aircraft.

So, yes, looking forward, this is going to get worse, but we have a problem here and now. If you're looking in this field, if you're looking in offsets, if you're looking in tech transfers, and again Commerce Department did a good job of outlining these issues, but the difficulty of, in part because of our own companies unwinding all of this.

MR. ELWELL: Uh-huh.

COMMISSIONER WESSEL: With a fair and level playing field, I agree with you, and we should be selling them. They shouldn't be producing their own aircraft on a fair and level playing field. They should be buying the best the world has to offer.

How do we ensure that we're going to be able to maintain a competitive edge in this industry? You seem to have enormous faith that China's subsidies and activities are going to have no impact.

MR. ELWELL: I'm not saying that subsidies have no impact. I'm saying that we have mechanisms in place via the Commerce Department, the World Trade Organization. They're signatories to it--to work to ensure that the level playing field exists. If a level playing field doesn't exist, our companies who have been dealing fairly and competing aggressively and fairly for decades will certainly raise the alarm, but to my knowledge, I'm not aware at this point of our companies raising that.

COMMISSIONER WESSEL: Mr. Herrnstadt.

MR. HERRNSTADT: Yes, thank you for your question, Commissioner Wessel.

I think we're seeing anything but a fair and level playing field. All one has to do is hit a Google search, and you can see how we're not facing that.

First of all, aerospace companies are being, in essence, forced to transfer technology and production to China in return for market access.

That flies in the face of any notion of a fair and free playing field where companies are supposed to compete on quality and price of product, number one.

Number two, there's the issue of cheap labor, which some would

argue could also transfer into a subsidy. China doesn't recognize international labor standards like the freedom of association and so forth.

Three, there is the whole issue about subsidies itself and the lack of transparency. Certainly one should question where all the investment money is coming from as discussed in the previous panel. Is the U.S. as concerned with China as they are about European subsidies? One wonders if the U.S. has started to take a very close look at what subsidies may or may not be taking place in China.

There are many other ways we can talk about fair and level playing fields, least of which is when China does come up with a product, whatever product it is, whatever equipment it is, one wonders how it will be priced, given the lack of transparency in cost structure of China's products.

So when we're talking about a fair and level playing field, you would think that U.S. companies would be asking for assistance to make sure that there is a fair and level playing field. That's something that they've argued about in terms of free trade agreements. It should certainly be something that they're concerned about when it comes to China's aerospace industry.

COMMISSIONER WESSEL: Thank you.

HEARING CO-CHAIR VIDENIEKS: Commissioner Mulloy.

COMMISSIONER MULLOY: Thank you, Mr. Chairman.

I want to pursue with Mr. Elwell, your association, what companies do you represent?

MR. ELWELL: We represent over 270 aerospace companies, manufacturers from the smallest sort of mom and pop shops all the way up to Boeing, Lockheed Martin, the largest.

COMMISSIONER MULLOY: Okay. And are they all American incorporated companies?

MR. ELWELL: They are. There are some companies that have international partnerships, but they all by definition have manufacturing capabilities in the U.S.

COMMISSIONER MULLOY: In your testimony, you make the case that, "AIA does not take a position on specific corporate decisions, but in general AIA supports joint ventures because they advance U.S. technological leadership and increase the number of high quality American aerospace jobs through the growth of exports and market share."

The Commerce Department in their testimony, earlier today, page six of Mary Saunders' testimony, she says, "China has increasingly required that joint ventures be established as a condition for awarding manufacturing contracts."

Is that true?

MR. ELWELL: I don't know if it's a condition for contracts. I don't believe that what's commonly called "offsets" are any different in China than what's established in other transactions or other international agreements between corporations.

COMMISSIONER MULLOY: Okay. Then she further says these joint ventures typically involve some element of technology transfer by the U.S. partner. Is that true, that you have to transfer technology as part of--

MR. ELWELL: Again, it depends on the definition. Our companies are the technological leaders worldwide, have been, you know, for a century, and intellectual property is the keystone to their success.

COMMISSIONER MULLOY: Yes.

MR. ELWELL: Some of the technology transfer that takes place, by definition, as Mr. Andersen said earlier--two, three generations ago. There is not technology transfer ever. There's not technology transfer in the areas where our companies have their market edge.

COMMISSIONER MULLOY: Then Ms. Saunders further said that while China doesn't officially have an offset policy, and made specific commitments in the WTO not to, she says a company's, quote, "commitment" to building a relationship with China is a factor in purchasing decisions.

It seems to me she's saying that sometimes the Chinese will say to a company, you really want to show you're part of helping us, that you should transfer and be in a joint venture in order for us to buy your airplanes. Do you know whether that is going on?

MR. ELWELL: No, sir, I don't.

COMMISSIONER MULLOY: Mr. Herrstadt, do you have any views on these questions that we've just gone through?

MR. HERRNSTADT: Yes. Thank you, Commissioner, I do, and a lot of them are outlined in my written testimony, also in an article that is cited in the testimony on offsets that was issued by the Economic Policy Institute.

But let me just read you very quickly from my testimony a quote from a report made by one government agency.

COMMISSIONER MULLOY: Which government agency?

MR. HERRNSTADT: The Federal Aviation Administration, who did a study about two years ago on Risk-Based Systems for Overseeing Aircraft Manufacturers' Suppliers. Quote: "Major manufacturers develop agreements with foreign suppliers to produce major segments of their aircraft in exchange for large aircraft orders from the country's carriers. These agreements can amount to billions of dollars in sales for

the manufacturer."

They go on with other examples. This Commission itself has also noted these transfers. They're not really all that transparent. One can guess, to a certain extent, but that's one of the real problems since it's a murky area. Offsets, whether it's in Europe or China, especially China, are very murky. It's very hard to tell exactly what's going on.

The companies certainly don't give that information to labor unions, trade union representatives, but one can certainly guess what's done, you know, judging from what I've read in terms of government documents and things like that that are contained and reflected in my own testimony, it certainly looks like it's apparently there.

COMMISSIONER MULLOY: Do you think our government should play a bigger role and try to reset the way this thing is working right now?

MR. HERRNSTADT: Precisely. And in my statement, in my testimony, I give some policy recommendations. One of those goes directly to that. The issue of commercial offsets or defense offsets in any industry, particularly aerospace, is one of particular importance for our national and economic security.

There needs to be much tighter regulations on, first of all, tracking and gleaning what is going on out there. Since it's very difficult to track, there is the direct offset, aircraft sale for a part, there's the indirect offset, which may be a completely different good in return for the sale, and we need to have some very, very well-defined areas where we can get this information from companies.

And then, second, we need to move rapidly to eliminate this market distorting mechanism. Those who argue that they're for free trade should be some of the first people that are arguing for the elimination of this market distorting mechanism.

COMMISSIONER MULLOY: Thank you both very much. Thank you.

HEARING CO-CHAIR VIDENIEKS: Okay. You're next, Commissioner Blumenthal.

HEARING CO-CHAIR BLUMENTHAL: Okay. Yes, thank you.

These numbers are extraordinary, Mr. Elwell, in terms of exports. We usually hear the opposite in testimony, and hearing about deficits, not surpluses, so actually I want both of you to react to this. \$5.5 billion in commercial aerospace exports to China; 644,000 high skill--that seems to me exactly what we're looking for. So I wonder--and when you do your estimate of the market, but beyond that, that seems like in a playing field that's not level, you're doing pretty well. I imagine if the playing field was level, I would assume you'd be doing better.

I guess I would ask the following question: you're doing that well in that market and the market is going to grow you say to \$400 billion over the next 20 years. Mr. Herrstadt, you used the example of Japan and "made in Japan" label, and everybody who argued basically in the late 1980s that Japan was going to overtake the United States, and the Japanese economy is in absolute disarray right now. And, in fact, we worked out our economic relationship in ways that I think really benefit--they're creating great jobs here in the United States in a lot of different ways.

So I guess what I would answer is that's a big market to capture, a huge market to capture, and are either of you really concerned that they're going to be competing? Well, there's the issue of competing within China, and then there is this other issue of will the Chinese with all the subsidies in the world and all the level playing field in the world really be able to build at the level of a Boeing or an Airbus and compete with you in the international market?

It seems kind of far-fetched, but I just want to hear both of your thoughts on the matter.

MR. ELWELL: Commissioner Blumenthal, not in the near or medium term. When we look at a product like the Boeing 777 or the 787 where there are thousands of second, third, fourth tier suppliers, some of whom have developed over generations and decades proprietary technological advances that no single airframe or like a Boeing or an Embraer, Bombardier know how to do, the competition, the fierce competition to assemble and assimilate all of those disparate technologies into one vehicle and sell it is not something--it's much too high a bar for a single country to gather, collect and produce competitively in, again, as I said, in the near to mid-term.

These products that U.S. workers put together and sell at a tenfold export ratio in aerospace, these products are the safest and most efficient in the world and will remain so for quite a long time to come.

[Panel IV: Discussion, Questions and Answers resumes on page _137_]

PANEL V: CONGRESSIONAL PERSPECTIVES

HEARING CO-CHAIR BLUMENTHAL: Thank you.

I'm sorry to interrupt. We have Congressman Bartlett here. We'll have him make his remarks, and then return to the panel. I'm going to grab my last two minutes afterwards, but first we're going to have Representative Bartlett speak first.

We are delighted to have Congressman Bartlett here to present his views on Chinese aerospace capabilities and implications for the United

States.

Congressman Bartlett is now serving his ninth term in the United States House of Representatives. He was first elected to represent Maryland's Sixth District in 1992. Prior to that, he pursued successful careers as a professor, scientist, inventor, as well as small business owner.

Congressman Bartlett is a ranking member of the House Armed Services Committee on Air and Land Forces. His leadership on this subcommittee makes his insight into China's emergent military airspace and commercial aviation capabilities particularly relevant.

We thank you very much, Congressman, for taking time out of your busy schedule to come here and share your thoughts with us.

STATEMENT OF ROSCOE BARTLETT
A U.S. CONGRESSMAN FROM THE STATE OF MARYLAND

MR. BARTLETT: Thank you very much.

I'm going to do something I don't ordinary do. I'm going to read statement. Thanks to a very competent staff, it says it better than I could have said it so I'm going to read the statement. Then I have, if you have a few moments, some charts I'd like to show you very briefly.

I've testified before this Commission before. It's a pleasure to join you today. I want to thank the Commissioners for inviting me to come.

China's military aerospace and commercial aviation capabilities are best understood in the greater context of China's military expansion. That expansion is fueled by economic growth. Increasing energy consumption to support economic growth, particularly oil, is a major driver for China.

Though committed to a post-oil future, China's ambition to control 50 percent of its anticipated oil consumption provides much of the impetus for its military planning. This can be seen most clearly in China's aggressive development of a blue water navy.

I would like to review some information from four reports, comment upon them, and then engage members of the Commission in a discussion about them. The reports are the Defense Department's 2009 Annual Report to Congress: Military Power of the People's Republic of China; this Commission's 2009 Report to Congress; "China's Planned Evolution of Naval Capabilities," published by STRATFOR on January 20, this year; and "Fueling the Dragon: China's Race into the Oil Market," by Gal Luft of the IAGS published this month.

I will take the last first. I believe that there is too little consciousness of the role that energy and oil plays. I believe that

energy is the greatest challenge facing us in the 21st century.

Gal notes that, and I quote, "With real gross domestic product growing at a rate of eight to ten percent a year, China's need for energy is projected to increase by 150 percent by 2020. Its oil consumption grows by 7.5 percent a year, seven times faster than the U.S. By year 2010, China is expected to have 90 times more cars than in 1990. With our automobile numbers growing at 19 percent a year, projections show that China could surpass the total number of cars in the U.S. by 2030."

There is very little understanding of the impact of growth at 7.5 percent a year. Let me briefly review the implications.

The Defense Department's 2009 report notes that the PLA's "armed forces continue to develop and field disruptive military technology." Let me just note what two percent growth does. That's such a small growth rate that our economy doesn't like that; Wall Street doesn't like two percent. Two percent doubles in 35 years; it's four times bigger in 70 years; it's eight times bigger in 105 years; it is 16 times bigger in 140 years.

The world will still be here I hope in 140 years. And 7.5 percent growth doubles every ten years. So in just 30 years, it's, you know, eight times bigger in just that amount of time.

The Defense Department 2009 report notes that the "PLA's armed forces continue to develop and field disruptive military technology, including those for anti-access/area denial, as well as for nuclear, space and cyber warfare, that are changing regional military balances and that have implications beyond the Asia-Pacific region."

Six areas of singled out. Number one, defense budget outpacing economic growth; number two, strengthened deterrent and enhanced strategic strike; number three, improving anti-access/area denial capabilities--I will comment a little more on this in just a moment; regional conventional strike; competing for dominance of the electromagnetic spectrum.

The report also details some persistent limitations. The most relevant for today's focus is aerial refueling capability to support force projection.

This report also includes a small section about the role of oil contributing to China's military development. It notes, and I quote, "In the last decade, China has pursued long-term supply contracts with a diverse range of supplier nations, including Chad, Egypt, Indonesia, Kazakhstan, Nigeria, Oman, Russia, Australia, Saudi Arabia, Sudan, Venezuela.

We have a chart which shows that here, and this shows China's acquisition to oil from all over the world. And they have been scouring the world for oil, not just buying oil but buying goodwill. Is it roads

you need, a hospital, a soccer field? Whatever it is, China has been very aggressive in doing this.

Gal notes that "China has become increasingly dependent on Middle East oil today. 58 percent of China's oil imports come from the region. By 2015, the share of Middle East oil will stand on 70 percent.

I will tell you the reason for this shift is simple. The Middle East OPEC nations are where the oil is. This is where the oil must increasingly come from. OPEC is increasing its world market leverage.

Let me show you a chart here that shows that very plainly. This is a very interesting chart. This is "The World According to Oil." This is what the size of the countries of the world would look like if their size was relevant to the amount of oil they have.

Saudi Arabia there dominates the globe. They have 22 percent of all the oil in all the world. And look at little Kuwait over there. To Saddam Hussein it looked like a little province down there in the southeastern part of his country. There it is, huge, huge amounts. It dwarfs, it dwarfs the United States. Little Kuwait dwarfs the United States. But look at China and India with a third of the world's population and little oil.

Our country, our first, and it used to be our second, biggest supplier was Mexico. Our first was Canada, and then it was Mexico, and they have less oil than we. There aren't very many people in Canada so they don't need the oil, and they're too poor in Mexico to use the oil, and so they were selling it to us.

Now, Saudi Arabia is our number two supplier because the second largest field in the world in Mexico is in very rapid decline. This shows a very interesting picture. China, look at tiny amount of oil which China has, a 1.3 billion people, but they're now buying oil all over the world.

Defense Department report notes that China has also pursued equity positions in a variety of overseas energy assets and investments. I would say that this is an understatement. Our own State Department has very little understanding of China's investments in oil.

Let me recount an exchange I had with them. I asked the State Department why would China be buying oil? Because in today's world, that makes no difference who owns the oil. We own only two percent of the world's oil in our country. We produce eight percent which means we're going to pump our wells dry faster than the average in the world.

It's a global market, a global auction; who comes with the dollars buys the oil. So why would China be buying oil? And their response was China doesn't understand the marketplace. Come on now. A country growing at--what--14, 16 percent a year doesn't understand the marketplace. Of course, they understand the marketplace.

Much more worrisome to Gal Luft are aggressive efforts by China to negotiate deals with America's largest oil suppliers: Canada, Saudi Arabia, and Mexico, and our fourth largest supplier, Venezuela.

I would like to come back now to the PLA's improving anti-access/anti-denial capabilities. China's efforts to enhance its anti-access capabilities bear directly upon the balance of airpower in the Pacific region. I would like to draw your attention to China's development of a carrier-killer missile. U.S. Admiral Robert Willard testified to Congress on March 23 of this year that China, quote, "is developing and testing a conventional anti-ship ballistic missile designed specifically to target aircraft carriers as part of its anti-access area/denial efforts."

This development was studied closely by Andrew Erickson, a researcher at the China Maritime Institute at the U.S. Naval War College. As reported in the Defense News on April 2 this year, it says China's anti-ship missile could alter U.S. power.

Such a missile, and these are quotes, "could change the strategic equation and dramatically diminish America's power projection."

This is a ballistic missile which after it reenters the atmosphere turns itself around. It can't look out the front end. That was the reentry cone. It turns itself around, and it looks at the target it's supposed to attack, it now identifies that targets, turns itself back around and zigs and zags as it comes in.

It is a game changer. We have no defense against that, are not likely to have defense against that. There is a 1,200 mile standoff, which means that if they put that on a ship, it will be impossible to get 1,200 miles away from any Chinese ship in the world. So this is a real, real game changer.

"Such a missile could change the strategic equation and dramatically diminish America's power projection." This is from an Admiral.

"A Chinese ASBM would affect U.S. strategy in the region, for even the likelihood of the capability may have a large deterrent effect."

"The ultimate conclusion one begins to come to is that U.S. carriers will very soon no longer be the uncontested juggernaut of the world's seas." And this is a quote from the Admiral.

The world is changing. For six decades now, we have been the master of the sea and air, and that is changing with these anti-ship missiles and with the vastly improved ground-to-air missiles, our mastery of the sea and the air is now coming to a close.

Rear Admiral Michael McDevitt, who is now retired, testified before this Commission that as China's anti-access capabilities increase, China's military capabilities will likely grow apace, allowing the United States to maintain the "delta of advantage" it currently enjoys for the

next four to five years. That's not a very long time.

Rear Admiral McDevitt testified that China's military modernization, ostensibly defensive in nature, is, quote, "creating a dynamic that as its security situation improves, it is making the security environment for many of its neighbors worse."

It should be no surprise that the report found that, again, I quote: "Concern about China's naval modernization is beginning to fuel a maritime arms race in the record."

Among nations cited as having begun to augment their own navies by purchasing naval platforms and weapons are Australia, India, Vietnam, Indonesia, Malaysia, Singapore and South Korea.

China's planned expansion of naval capabilities published by STRATFOR on January 29 of this year reported on a recent commentary by the China Internet Information Center about plans by China to, and I quote, "to build overseas bases to support naval operations and protect China's interests abroad."

China is purchasing all this oil. I will tell you that I believe that the day will come that China will say, guys, gee, I'm sorry, but it's our oil and we can't share it. To make that a reality, they're going to have had a blue water navy big enough to protect the sea routes.

Forty percent of all the oil, world's oil, I think, goes through the Straits of Hormuz, and--what--80 percent of the oil to that part of the world goes through the Straits of Malacca so they're very important chokepoints here that need to be protected.

Just a day earlier, Captain Chris Chambers told a conference in Singapore that China will be increasing its participation, including a shared leadership role, in the multinational anti-piracy naval operations off the coast of Somalia. This is the Shared Awareness and Deconfliction working group, the SHADE group.

Pending "final approval in Beijing," China, quote, "will expand its current three-ship task force and take responsibility for more patrols in areas of more active piracy. The anti-piracy operations have given Beijing the perfect opportunity to test and refine its capabilities. Taking a leadership role in SHADE also gives China a valuable opportunity to observe and learn protocols and operations of other nations' fleets. The extended mission raises discussion of a resupply base in the Indian basin" that would be opposed by India and the United States.

Why is China undertaking this expansion of its naval capabilities?

We come back again to the foundation of energy from oil to fuel economic growth. STRATFOR notes: "China's economic growth has led to a major shift in the country's resource needs. China now imports large amounts of raw materials, including oil and minerals in the Middle

East and Africa.

Reporting for SIGNA Magazine on April 10 of this year, James Bussert in "China Enters the Aircraft Carrier Club," reviewed a series of "seemingly unconnected steps over the past two decades have positioned the People's Republic to begin construction and incorporation of a modern carrier into its fleet."

Twenty years of planning leading to carrier capability. A five-point plan for post-oil future. I led a delegation a little over three years ago to China. I was stunned. Nine of us went. And I was stunned they began their discussion of energy by talking about post-oil. There will, of course, be a post-oil world. And China is focusing on that, and they had a five-point plan.

The first part of the plan, the first part of any sane plan, is conservation, use less. Then find alternatives, as many as you can from your own country. Be kind to the environment was the next one, and they know they're not kind to the environment, but they have 900 million people in rural areas that through the magic of, miracle of communications, know the advantages of an industrialized society, and they are demanding those advantages, and China I think sees their empire unraveling the way the Soviet empire unraveled if they can't meet these needs. So China is very focused on getting more energy.

I just have one chart that I want to close with here, and if you had only one chart to look at that gives you some indication of where we're going in the future, this would be chart. This is the oil chart.

By the way, I think the most insightful speech given in the last century just had its 53rd anniversary the 14th day of this month, and that was a speech given by Hyman Rickover, the Father of our Nuclear Submarines, to a group of--the audience irrelevant--it was a group of physicians in St. Paul, Minnesota, in which he noted, in which he noted that in the 8,000 recorded history of man, the age of oil would be but a blip. He had no idea how long the age of oil would last. We now know how long the age of oil will last.

But he said how long it lasted was important in only one regard: the longer it lasted, the more time would we have to plan an orderly transition to other sources of energy. Of course, we have done none of that. With reckless abandon, we have been intent on finding, drilling and using the last vestiges of oil in the earth. I have ten kids, 17 grandkids, and two great grandkids. I'd like to leave a little for them.

Is that reasonable? Okay. This is a very interesting chart. The big bars there shows when we have found the oil. Most of it in the past.

We will find some more oil, but we'd like to use some more oil. China and India sure as heck are going to like to use more oil. We'd like our economy to grow. We're going to be more than lucky if the more oil we

find in the future is as much as the more oil we would like to use.

So the world is pretty much stuck with what's out there for the future. Now, this solid line here is the consumption of oil. Notice that a dramatic thing happened in the '70s. Let's thank the Arab world for what they did in the Arab oil embargo in the '70s. Look what it did. It woke us up. If it weren't for that, look where this would be. It would be off the chart. But they woke us up. We paid a lot of attention.

Your air-conditioner today is probably three times as efficient as it was then. Enormous efficiencies. So now the rate of growth is much slower.

From about 1980 on, we have had to dip into reserves. All of this area here is where we dipped into reserves. So we've used about this much reserves. We have this much left. We'll find some more. But I don't think the more we find, I don't think that anybody believes the more we find will equal the more we'd like to use.

So we're kind of stuck with what we've got. It's a 1.2 trillion barrels. You know that big gusher out in the Gulf of Mexico, it may be, it may be a billion barrel well. Do you know how long that lasts the world? 12 days. Every 12 days the world uses a billion--check my arithmetic--84 million a day. I think 84 goes into a thousand roughly 12 times; doesn't it? Okay. A billion barrels of oil. Every 12, we have 1.2 trillion barrels of oil. That will last us 40 years. That's not falling off a cliff.

For now on, it's going to be ever harder and harder to find, more and more expensive, less and less of it available. Admiral Rickover, the age of oil will be about 300 years. We're 150 years into it. Another 150 years, we will be through the age of oil, and what a ride it's been. What a ride it's been.

But the next 150 years are going to be enormously challenging, and the area that you all are interested in, China, particularly challenging there. 1.3 billion people with a huge appetite for oil. Buying oil all over the world. Aggressively building a blue water Navy. Just put two and two together.

By the way, the fifth point in China's five-point plan is international cooperation. They know that they can't do it alone. We can't do it alone. But while they plead for international cooperation, which I do not think we will get, they plan for an inevitability without it.

Thank you all very much for inviting us to be with you today.
[The statement follows:]

Panel IV: Discussion, Questions and Answers (resumed)

HEARING CO-CHAIR BLUMENTHAL: Thank you very much, Congressman Bartlett, for your time.

I'm going to set the example and not keep going. We have to speed through our next five witnesses. I took three minutes. Hopefully, we can all be very quick and prompt with our questions.

HEARING CO-CHAIR VIDENIEKS: Commissioner Wortzel is next.

COMMISSIONER WORTZEL: Mr. Herrstadt, Mr. Elwell, one of the things that we heard this morning is the future, China's Air Force may seek to have long-range bombers and long-range military transport aircraft, two things that they really lack today.

Of course, our concern here on the Commission, and the reason for this hearing, is that ultimately civil air cooperation with China will make major contributions to that military capacity and would then contribute to relative military power, the sorts of power projection that the Congressman outlined.

Are either of you concerned at all that transfers of technology and manufacturing know-how might improve these anti-access strategies and build projection capability for China?

MR. ELWELL: As a veteran, I'm personally interested and I'm really glad that we have the export control regulations and structure that we have. All the technology that goes into China from our industry is dual use and every single bit of it has to be vetted through DoD.

COMMISSIONER WORTZEL: Is a C-141 dual use?

MR. ELWELL: C-141?

COMMISSIONER WORTZEL: Yes.

MR. ELWELL: It has a civilian designation, but it's not, as--I'll have to get back to you on. I don't believe it's on the list to go to China or to be built in China or sold to China. So I have complete trust in the rational export control system that we have in place.

MR. HERRNSTADT: Commissioner?

COMMISSIONER WORTZEL: Yes.

MR. HERRNSTADT: Can I respond as well? You know, given the lack of transparency that exists and at times the close geographical proximity of commercial aerospace with defense aerospace, I think you're asking very serious questions and questions that deserve very serious answers on it.

We recall the debacle of the trunk liner program from many years ago. And it certainly is an issue that requires that we shed a very careful light on, and when we talk about our own Export Control Regime, it's something that obviously, although, you know, there's an effort to reform that regime for the U.S., it's something that we want to be very careful about, that we want to tighten up so that we don't get

into trouble in the future.

I don't want to take up your time with this, but at some point I would like to come back just for a minute to respond to Commissioner Blumenthal's questions on the export numbers and others that he did pose before the interruption.

HEARING CO-CHAIR BLUMENTHAL: Maybe we'll take that for the record.

VICE CHAIR BARTHOLOMEW: Yes.

HEARING CO-CHAIR VIDENIEKS: Commissioner Reinsch.

COMMISSIONER REINSCH: Owen, you said several times that we don't have enough data on the offsets question. What is inadequate about the Commerce Department's offset report? What's missing?

MR. HERRNSTADT: Sure. Thank you, Commissioner Reinsch.

Well, first of all, I assume you're referring to the Bureau of Industry and Security's annual offset report on defense offsets.

COMMISSIONER REINSCH: Yes.

MR. HERRNSTADT: One, it's limited to defense, just that. Number two, it's anecdotal so it's very difficult to know exactly what programs are being involved and what aren't. Number three, when it comes to determining what the employment impact of those offsets are, BIS, I think, even acknowledges the shortcomings of their data.

They don't look at, for example, they make some assumptions on exports, on what is included as a domestic content in terms of those exports. They extrapolate the numbers as opposed to gleaning some precise information but, by and large, at least they're doing something and they should be commended for that.

Of course, they have to do it by statute, but it's all aimed at defense. We're talking about commercial and there is no parallel type of requirement in terms of commercial offsets.

COMMISSIONER REINSCH: Point well taken. I think I'd take issue with your comment that it's anecdotal because it's a statutory requirement. It's based on a survey that's supposed to be comprehensive. It may or may not be. I'm not sure that if we were to do it on the civilian side, we would be able to do it any other way or produce results that were more comprehensive, but related to that, what do you see as the prevalence of offsets on the commercial side as opposed to the military side? Greater, less, the same?

MR. HERRNSTADT: You know I wish I could give you answer on that. But I really can't because, you know, companies aren't--I'm not privy to what companies are actually engaged at, and it just doesn't involve China; it involves Europe and elsewhere, but that really begs the question, why don't we know? This, as we've all talked about, is one of the essential engines of our economy.

We're still exceeding in terms of exports on that, although I would like to address that issue, and it's something that we do really need to take a much closer look at on that. We just don't ask.

COMMISSIONER REINSCH: Let me ask a slightly different question. Full disclosure, Mr. Herrnstadt and I have been discussing this issue probably for 20 years, and it's depressing that we're still about where we were when we began. I share his views about the magnitude of the problem and his frustration in our collective inability to deal with it although we have not consistently been in quite the same place on how to deal with it.

Looking at aircraft specifically, there are only two big large mainframe aircraft manufacturers in the world. Why can't they just get together and agree not to play this game?

MR. HERRNSTADT: I think that's a most excellent question, and it's one that we've been asking for a long time. I think it would be very helpful if the U.S. and the EU actually got together and discussed this in bilateral discussions transatlantically and in multilateral discussions as well.

COMMISSIONER REINSCH: Yes. I proposed that 15 years ago, and nobody paid any attention. I still don't have a good answer to the question. It seems to me that this is a problem that is actually solvable. There are only two parties, and if they both agree not to play the game, it kind of leaves everybody holding the bag.

Finally, going back to Commissioner Wessel's line, which was pursued by some others, I'm in the category of people who believe the playing field is not level. I don't think there's any question about that. We've said it; lots of people have said it.

There are two categories of things to do about it. A lot of the discussion here is focused around the offensive things: how you use the rules, how you use procedures in order to try to deal with subsidies. And that makes perfect sense, and I think we'll probably be exploring that going forward.

The other part, Mr. Elwell alluded to; perhaps you can elaborate a little bit more. In a global supply chain world, which is what we have now, which is very different from the world we had, say, 25 years ago, the real question seems to me is not how do we alter the other guy's behavior, but how do we run faster?

How do we accelerate our own R&D? How do we maximize our own R&D? And how do we accelerate the process of turning that R&D into new cutting-edge products that we can capture market share and lead the world? And that, it seems to me, is what some of the industry does better than anything else. Do you want to comment on that? And then I'll stop.

MR. ELWELL: Well, thank you.

We've had a powerful aerospace industrial base for many, many years, and I think the key to your question is to maintaining that technological edge really goes to our nurturing our workforce and, what we call at AIA, STEM, keeping the best and brightest minds in this country in our industry, in our technologies, and always, as I think as Mr. Andersen said earlier, always keeping us one or two generations ahead of whatever the other guy or the other country, the other region, is doing.

COMMISSIONER REINSCH: Well, the other comment I'd make in closing is you ought to get together with Mr. Herrstadt then. It's hard to nurture your workforce if they're disappearing, which is his point, but in any event I give back whatever time I have left.

HEARING CO-CHAIR VIDENIEKS: Commissioner Fiedler.

COMMISSIONER FIEDLER: Thank you.

A couple of quick questions and then a comment. Ms. Saunders, who's been referred to a number of times today, said there was 478,000 people working in the aerospace manufacturing sector. You say there are 644,000. How many are there?

MR. ELWELL: I'm sorry. My number includes the whole aerospace industry, defense and civil.

COMMISSIONER FIEDLER: She actually appears to include it all, too. So you say all meaning what? Parts and everything else, and the restaurant outside the factory or what?

MR. ELWELL: Second, third tier suppliers, the entire supply chain.

COMMISSIONER FIEDLER: Mr. Reinsch mentioned that there are two large aerospace companies that provide, that sell huge passenger aircraft, Airbus and Boeing. Those are the two you were referring to.

The Chinese, every time there's a burp in the relationship between the United States and China, some event, threatened to stop buying Boeing aircraft. It's always struck me as ridiculous, and I'd like to see if we can get to the bottom of this. Have they ever not ultimately bought Boeing aircraft?

MR. ELWELL: I don't have the answer to that.

COMMISSIONER FIEDLER: They've punished people--they say if this doesn't change, we're not going to buy Boeing aircraft? Have they ever not? The answer is they've continued to buy--right--because there are only two choices and because they don't want to be dependent, in answer to Mr. Reinsch, they don't want to be dependent on any one manufacturer because that manufacturer could raise the prices beyond their ability to pay. So they play them off but don't play them off.

They don't have much choice. So do you think that we can ignore in the future all threats against Boeing Aircraft if they haven't ever delivered on any of them?

MR. ELWELL: I'm not sure. Who's "we" as far as ignoring?

COMMISSIONER FIEDLER: We is the United States of America. In other words--or me, about this, or this Commission, could we ignore threats to Boeing Aircraft by the Chinese government because they can't deliver on them and never have? Because, as Mr. Reinsch says, they have no option but to buy their aircraft at the moment or Airbuses.

COMMISSIONER REINSCH: But they have delivered on them.

COMMISSIONER FIEDLER: What have they delivered on?

COMMISSIONER REINSCH: Look at the rising share of their market, the share of Airbus in the Chinese market and the declining share of Boeing in the aerospace--

COMMISSIONER FIEDLER: The question is not just the share. The question is in absolute dollars. Everybody is sitting here saying there's \$400 billion worth of aircraft and we're dividing it up. If it's divided equally, it's 200 billion apiece. If it's divided unequally, it is more or less one or the other, but it's still plenty of money; right? Has Boeing really been hurt--as a company? The workers have been hurt but not Boeing itself.

MR. ELWELL: The newest manufacturing plant--

COMMISSIONER FIEDLER: What I'm trying to do is take aircraft exports out of consideration in our policymaking deliberations in the United States because it essentially, it seems to me, does not matter.

HEARING CO-CHAIR BLUMENTHAL: I agree with that.

COMMISSIONER REINSCH: You lost me.

MR. HERRNSTADT: Can I?

COMMISSIONER FIEDLER: Yes. Owen.

MR. HERRNSTADT: Commissioner Fiedler, I think you're asking a very poignant question. We've always been told when it comes to offsets that if you don't engage in the offset, you'll lose the sale, but it's very hard to prove a null; right? It's very hard to know if that actually is the question, but I do want to go back, briefly, if I may, to your jobs question because I think it's important, and it's critical and it's one reason why I'm here.

So looking at Aerospace Industries Association statistics on total employment, all the numbers, aerospace and related, in 1990, they list total employment at 1,120,000, almost 121,000 workers. Actually if you go back to 1989, I think it's even higher.

2009, you get down to the number of 644,200. So you see a loss of over 40 percent. That's an incredible amount of jobs that are being

lost. This industry may be cyclical still, but there are structural movements going on and very profound ones when it comes to jobs, particularly when we see the major outsourcing that has occurred throughout the world.

Commissioner Blumenthal talked about Japan. Well, Japan is producing wings now, wings for a major program that U.S. workers could have done. Composite work in China, work that was produced by U.S. workers, and it's not just even the large commercial primes. It's the suppliers, it's the small sports planes or light plane work, that's going as well. These are huge numbers, and even though demand may require that they bump up a little bit, the question is will they ever get up to what they once were when our economy was thriving?

It's no secret that as these numbers go down, our economy has been in a crisis. Now there are obviously a lot of other reasons involved with than just aerospace, but these after all are the leading edge, high-skilled, high-paying jobs that we are banking on to get us out of our economic crisis and to propel us into a sustainable future.

COMMISSIONER FIEDLER: I agree with you wholeheartedly.

HEARING CO-CHAIR VIDENIEKS: Let me get Carolyn next. Vice Chairman.

VICE CHAIR BARTHOLOMEW: Thanks very much and thank you to both of our witnesses, for appearing today and also for being good sports and appearing on the same panel with people who are looking at what looks to be the same world and seeing amazingly different things.

So, I commend you for being willing to engage with us. Before I ask my question, I simply wanted to note that one of the other things that Ms. Saunders said earlier today, at the very end of her testimony, is in addition to China's C919, new aircraft programs that would compete with U.S. manufactured products have been launched or rumored in Canada, Brazil and Russia.

If the future of aviation is regional jets, the Chinese are moving to partner or to get technology from the three countries that have functioning aircraft manufacturers. So there is Airbus, there is Boeing, but there's an entire world out there of smaller jets.

But Mr. Elwell, I want to get to a couple of questions for you. Several times in your testimony, you refer to the short and the medium term. What are those time frames? What's short term?

MR. ELWELL: I don't have specific year definitions. In aircraft, in the manufacture, design and delivery and the refueling of aircraft, generally the long term is 20 plus; the short term is anywhere from current five, forward five, and the medium-term, five to 15, five to 20.

VICE CHAIR BARTHOLOMEW: Okay.

MR. ELWELL: I can get you the business years of that, but generally the long term is future generations and a generation of aircraft is anywhere 15 to 20 years.

VICE CHAIR BARTHOLOMEW: Okay. If it's different from that, could you get us the clarification on what it is?

MR. ELWELL: Absolutely.

VICE CHAIR BARTHOLOMEW: Thanks very much.

And then I'd like to unpack the statistics that you put just a little bit because you say U.S. imports of Chinese civil aviation products represented 1.2 percent of our overall civil aviation imports. Now, I think if we're all being honest, do we recognize that when we talk about aviation products, planes, a plane can skew the statistics quite significantly?

So what I'd like to know from you is what are these Chinese civil aviation products that we are importing, and what are the other 98.8 percent?

MR. ELWELL: Well, first of all, I believe the 1.2 percent is by value, if I'm not mistaken. As far as the actual products, I could beg to give you that as a follow-up.

VICE CHAIR BARTHOLOMEW: Okay. Again, my point being that if we import an Airbus plane, it costs how much? Oh, more than \$100 million.

MR. ELWELL: Depends on the plane.

VICE CHAIR BARTHOLOMEW: How much does an airplane cost? I recognize it depends on the plane, but if you're talking about a wide-body jet, what's the general ball park of how much they cost?

MR. ELWELL: I think 100 million is fair for a wide body, yes.

VICE CHAIR BARTHOLOMEW: I thought it was more expensive than that. But, so, my point being, it would be interesting to see what those imports are, who we're importing them from, and where this fits in?

MR. ELWELL: Of course, we wouldn't be importing a wide body from China so--

VICE CHAIR BARTHOLOMEW: No, no, no. But you say that this is 1.2 percent of our overall civil aviation imports. So that's 98 percent that we are getting from other places.

Owen, do you have?

MR. HERRNSTADT: Yes, I think you're really on to something, and it makes us really ask how are we calculating these export numbers and these values? First of all, the value of the products made in China, are they coming in the currency valuation in China or is it in U.S. dollars or the fair market value in the U.S.?

Second of all, what goes into our own exports? You know we

outsource all around the world. What goes into making a U.S. product-actually something considered to be a U.S. export? What does domestic content mean? We have issues like when a foreign component comes in, it can under some circumstances become substantially transformed into a domestic component. What does that mean?

And all of those questions then come out of it so that when we look at the entire export number and we look at a value of it, there's a lot of wiggle room going on there, and that's why what's critical to look at, at least for our purposes, is, all right, well, let's look at the actual number of jobs, domestic jobs, that are created from that so that we have a tangible concrete number that impacts upon our own economy.

MR. ELWELL: To answer your question, that is in U.S. dollars, and just to put it in context, if you use apples to apples as far as the products you get, Mexico, we imported more aviation products from Mexico last year than from China.

VICE CHAIR BARTHOLOMEW: Okay. Well, again, if we could get a breakdown for the record, that would be helpful, and then I recognize we're definitely out of time, and--

HEARING CO-CHAIR VIDENIEKS: One more question, a series of questions from Commissioner Shea.

COMMISSIONER SHEA: I'll try to be quick. I just want to mention that Hyman Rickover has two mentions today. Not only was he mentioned by the Congressman, but one of our witnesses was the commander of the attack submarine USS Hyman Rickover in a previous life. So I just want to point that out for the record.

I want to get to this issue of offsets again, I guess following up on Mr. Reinsch's comment. Mr. Herrnstadt, you said that offsets occur when one country demands a transfer of technology and/or production in return for a sale.

So no one is forcing us to make a sale. Just as a matter of common sense to me, absent an agreement on the part of China not to engage in this practice, then it just seems like they're driving a hard bargain, and your real beef is with the U.S. companies rather than with the person on the other side of the transaction driving a hard bargain. Is that fair to say?

MR. HERRNSTADT: I guess the real question, I wouldn't frame it as my "real beef." My real concern is that we're doing nothing in terms of a comprehensive government policy to help assist those U.S. companies who wish not to engage in that. At the same time, we should be talking to our own U.S. companies about engaging in this activity.

COMMISSIONER SHEA: Okay. Has your union ever raised this issue with management? I mean frequently or how often? Is it part of your collective bargaining?

MR. HERRNSTADT: It's a very serious aspect that our members have been asking for many, many years, I can assure you that.

COMMISSIONER SHEA: And what's the response from the management?

MR. HERRNSTADT: Well, the response from management, in general, has been, and I think you can see folks from the aerospace industry saying in years past, it's a, quote-unquote, "necessary evil," and/or "it's not that big of a deal," or other things like that.

Some have expressed concern on it, but yet year after year goes by and offsets continue and outsourcing continues, and we see that the job numbers are dramatically decreasing as our worst fear, and of course there are many reasons for that, but this is one of those reasons.

COMMISSIONER SHEA: I know in one of your recommendations is that you should raise--U.S. policymakers, the U.S. government, should raise this issue in the context of forums like the U.S-China Strategic and Economic forum or Dialogue.

And then this is just for my clarification. Ms. Saunders said that China did make a specific commitment not to impose aircraft offsets as part of its WTO accession. I'm unaware of whether or not that is true. If the staff could provide that, I'd find that very helpful. But is it your view that this is a violation--these offset requirements are a violation of China's WTO obligations?

MR. HERRNSTADT: Well, if they are occurring, I think it's a serious concern absolutely to look at, and I think that's a best question put forth to the Commerce Department and USTR on that. I think all one really needs to look at is the government report on trade barriers, also I should mention, covers many of the other things that China is doing with respect to that.

COMMISSIONER SHEA: Do you talk to--I have a minute--is Airbus unionized?

MR. HERRNSTADT: In Europe?

COMMISSIONER SHEA: Does Airbus have a unionized workforce?

MR. HERRNSTADT: In Europe.

COMMISSIONER SHEA: In Europe, yes, exactly.

MR. HERRNSTADT: Yes, yes.

COMMISSIONER SHEA: Does your union ever talk to the leadership of Airbus union and talk about these offset issues--all the time?

MR. HERRNSTADT: We've discussed them with the European Metalworkers Federation and others, and I know that they are concerned about it, particularly with respect to China as well.

COMMISSIONER SHEA: Okay. Mr. Elwell, what's your

understanding of the U.S. companies--I mean Mr. Herrstadt says, well, they respond to us that these offsets are a necessary evil. Do you view it that way as well?

MR. ELWELL: Again, I think, I think Owen said it's anecdotal. But for us, I think the numbers speak for themselves. I mean \$5.5 billion in exports and 400 million in imports; it's a huge market all around the world, and market share is what it's all about, and intellectual property and keeping the excellence that our manufacturers and their employees produce in the marketplace.

Transactions and agreements are made for no other reason than to sell product, and it seems to be working in the aviation, commercial aviation industry.

HEARING CO-CHAIR BLUMENTHAL: Dennis, we're going to cut off and move on.

COMMISSIONER SHEA: Fair enough.

PANEL VI: MILITARY IMPLICATIONS FOR THE UNITED STATES

HEARING CO-CHAIR BLUMENTHAL: Quickly because we want to end by four. But thank you all very much and also thank you for your indulgence during Representative Bartlett's talk as well, and thank you to the panel, and we just want to move on and get the next panel up here quickly with no break. No break. And finish, try to finish on time.

Okay. Our final panel today will examine the implications of China's emerging military aerospace capabilities.

Our panelists are Dr. Rebecca Grant and Mr. Jeff Hagen. Dr. Grant is President of IRIS Independent Research, IRIS, a public-policy research organization, and also serves as the Director of the General William Mitchell Institute for Airpower Studies, a non-profit research arm of the Air Force Association. She has worked at RAND and the offices of the Secretary of the Air Force and Chief of Staff of the Air Force.

Jeff Hagen is a Senior Engineer at the RAND Corporation. His work includes modeling and simulation of military forces including the effects of advanced weapons systems and the future role of airpower, intelligence and information operations.

Prior to RAND, he was at the Propulsion Laboratory in Pasadena, California and the NASA Dryden Flight Research Center at Edward Air Force Base, California.

We're very pleased to have you both as our final panelists, and we're very pleased and excited to hear your testimony. Dr. Grant, if you'll please start.

**STATEMENT OF DR. REBECCA GRANT
DIRECTOR, THE MITCHELL INSTITUTE FOR AIRPOWER
STUDIES, WASHINGTON, DC**

DR. GRANT: Thanks for the chance to appear before the Commission.

In the past 15 years, China has progressed from a regional actor to a power that has nascent military capability to reach across the Pacific. We've heard from a number of experts already today so my testimony will focus on the China gap. That is the gap between China's steady pursuit of military capabilities under an artful strategy, contrasted with U.S. defense strategy, which is apparently chosen to downgrade and minimize the need for conventional deterrence in the Pacific.

I want to say at the outset that along with most Americans, I acknowledge that China is a very important economic partner. I had the privilege to visit several cities and military installations in China some years ago as a very junior member of a military delegation.

I am not a China expert, but I am a defense expert, and it appears to me that for too long we have had a very rudimentary view of China and its potential role in the world stage. We as Americans, I think, look somewhat for a black and white conflict akin to what we remember from the U.S.-Soviet confrontation in the second half of the 20th century.

With China, in the 21st century, we must address a much subtler duality. China will continue to be a friend, an economic partner. At the same time, we will seek to balance or contain any rapid spread of Chinese military power. This deterrence relationship will take place alongside business relationships. I think as a nation, this is something new in our major foreign policy challenges.

Should China continue its peaceful rise, we will all benefit, but the pace of Chinese military development is worrying indeed and contains an element of risk, and woe to any of us who believe that international trade inoculates nations against war and conflict for history suggests the reverse.

I want now to address what to me is the core issue from a military perspective, and that is frankly that China's military challenge from their own point of view is very straightforward. At the highest level, Chinese strategy can simply seek to disrupt U.S. military capabilities that will be operating at extended ranges in the Pacific.

It's an easy problem for them. China will have what the 20th century strategists once called "strong interior lines of communication."

In contrast, as we know, the U.S. must reach across the Pacific with a much more difficult aim or holding access open through a credible

ability to withstand Chinese attacks and to hit key targets in the area and perhaps on China's mainland.

No one wants to do that, but deterrence, the essence of deterrence in this theater is being prepared to do just that. We have seen significant changes in China's military doctrine within this decade. I think there are those who believe that some of this dates from a very specific incident, the transit of carrier battle groups through the Taiwan Strait in the mid-'90s.

At any rate, Chinese military doctrine has spelled out the change. I quote from one 2004 paper, a partial quote, which is that "in order to meet the requirements of informationalized air operations," says the Chinese military paper, "the Air Force has gradually shifted from one of territorial air defense to one of both offensive and defensive operations.

Emphasis is placed on the development of new fighters, air defense and anti-missile weapons, means of information operations and Air Force automated command systems."

The paper goes on to talk about the importance of training and integration of military capabilities.

To me, two elements stand out here that I want to bring to the Commission's attention. First is the deliberate shift to more offensive capabilities. This is very natural as a country sees a rise in its airpower capabilities for airpower is an offensive weapon by nature. It's very natural for that sophisticated application.

Second, China is embarking on this more integrated training and operations, and this, of course, is the combination that could give China the ability to very successfully battle against U.S. forces in the region.

So we need to watch for those capabilities to take the form of extending the range of air and naval operations. We need to watch for their ability to conduct cyber attacks, which can disrupt and confuse deployed U.S. forces across several different medium.

Let me try to give a sense of where I think this balance stands today. I would say that presently China does have the capability to significantly interfere with U.S. air and naval operations in the Taiwan Strait and somewhat beyond that range as well. Remember, please, that success in China's strategy does not require occupation of territory, sinking ships, fighting to a, quote, "win" over U.S. forces.

Success can come simply from making it difficult for the U.S. and allies to achieve objectives and operate in that area.

I would say overall the balance today is somewhat in favor of the U.S., but given its growing capabilities, China may soon be able to achieve its goals, not through outright defeat of U.S. forces but via disruption and inflicting losses which make efficient military operations difficult and could, of course, erode national support for such

operations in this country.

So, success for China can come simply from counterattacks on U.S. aircraft, ships, satellites and cyber links in order to disrupt operations. Ships do not have to be sunk or even hit in order to throw off the careful choreography of naval airpower and the strike groups, for example.

Fighters that launch from land or sea bases, U.S. fighters that launch from land or sea bases, will immediately confront integrated air defenses and superior numbers of PLAAF fighter aircraft. China possesses advanced surface-to-air missile variants that give them at least a 75 mile range against non-stealthy aircraft, and of course, they have the ability to knit aircraft and air defenses together into a rather formidable force.

They also have a reported ability to mount these air defenses on barge platforms at sea. Once our aircraft are beyond the missile fly-out rings, they will encounter large numbers of fighters on patrol. China's fighters are not on a par with our fourth and fifth generation fighters, namely the Superhornet, F/A-18EF, our more advanced F-16s and F-15s, and they certainly are not on par with the F-22.

However, in this type of scenario, numbers matter and allow China to parry our attacks. Again, the objective is not necessarily shooting down more U.S. aircraft than our U.S. pilots can hit, but merely hitting enough to degrade operations.

I think the worst case going forward would find China's fighters breaking through distracted combat air patrols to threaten our large body platform such as tankers and battlespace control aircraft.

This worst calculation, in my opinion, gets worse from here on out over the years and will give the U.S. less ability to be able to balance and deter China in a credible manner as that balance shifts.

I want to touch just on a few things that I believe are detriments within our U.S. policy that are making it difficult to balance and counter China over time.

One of these is the trend away from advanced technology. Many senior officials have recently talked about turning away from so-called exquisite capabilities. There's also been much discussion about how America's air and naval assets outnumber others. To me this is bean counting that does little to account for the fact that U.S. forces must project power across considerable distances.

A few more specific points. Early termination of the F-22 fighter at 187 aircraft will yield too few aircraft for the Pacific scenario. I'm happy to go into details on that should you require them. I would like to point that that current program will leave, for example, just 18 F-22s stationed in Hawaii and a further two squadrons in Alaska, a very small

number compared to the raw numbers that China can mount.

We've seen discussion of reducing aircraft carrier battle groups which puts an immediate dent, if that is carried out, into our capabilities in the Pacific.

We have no new bomber program. Secretary of Defense Gates terminated the program in April 2009. Research is underway for a so-called "family of systems," but the fact is the Pentagon does not have a funded and structured bomber replacement program at the moment. That means the ability to hold at risk any targets on China's mainland will fall to the 20 B-2s in our force of which on any one day just four to six will be available for operations. It's a very small number.

We fail to acquire a new area refueling tanker on which all of the systems I have just discussed depend. We hope to see that continue, but that failure now has put some risk into our power projection.

Finally, we have made slow progress in streamlining our military cyber space operations. There are plans for U.S. Cyber Command, but the command has not stood up, and many issues remain, and one suspects that the Chinese do not spend much time discussing lines of authority and Title 10, Title 32, and Title 50 issues, as we do here. It's important to get cyber right within our military set-up, and our slow progress does nothing to aid our balancing and deterrence of China.

I want to make my final comment on our regional allies. I visited Australia a month ago, and Australia's 2009 Defense White Paper points out clearly the issues that they see concerning the rise of China and India in the region.

The blocked sale of the F-22 fighter to Japan foreclosed a natural option for strengthening conventional deterrence through providing that to Japan's highly skilled air defense forces.

And finally is the status of Taiwan. Taiwan has about 300 aging fighter aircraft. They would like to acquire U.S. aircraft, specifically F-16s. This sale would be of benefit to the balance of power in the region, but it is, of course, politically difficult here in our country.

In conclusion, I want to say that a peaceful Pacific for the 21st century is what we all want, and it depends on the U.S. military's continued ability to balance and deter Chinese military capabilities. The U.S. must maintain the correct high-end force structure in order to make this possible.

The disparity in power benefits no one. A Chinese general pointed out in 2005, and I quote: "The more solid and credible our deterrence strategy becomes to the United States," he said, "the more careful it would be in considering forceful intervention."

I contend that the reverse is true, and the U.S. and its allies must uphold our side of the balance through strong conventional military

capabilities.

Thank you.

[The statement follows:]

**Prepared Statement of Dr. Rebecca Grant
Director, General William Mitchell Institute for Airpower
Washington, DC**

In the past 15 years, China has progressed from a regional actor with nascent military capability to the nation with the greatest potential to threaten US interests and allies in the Pacific.

The rise of China's capabilities from airpower to space launch to presumed acquisition and conversion of an aircraft carrier is well-documented in the Department of Defense's annual reports and in the testimony of other experts.

My testimony today will focus on the China gap: the gap between China's steady pursuit of military capabilities under an artful strategy, contrasted with US defense strategy, which has apparently chosen to downgrade and minimize the need for conventional deterrence in the Pacific. US policies and military capabilities have been oriented away from a realistic look at requirements for continued deterrence of China.

Along with most Americans, I acknowledge that China is an important economic partner. I had the privilege to visit several cities and military facilities in China as very junior member of an official US delegation some years ago. I am not a China expert, but as a defense expert, it is apparent to me that for too long, our view of China has been rudimentary. We look for "black and white" conflict akin to the US-Soviet confrontation in the second half of the 20th Century. However, with China in the 21st Century, we as a nation must confront a subtler duality. China will continue to be an economic partner; at the same time, we seek to balance or contain any rapid spread of Chinese military power in the Pacific. This deterrence relationship will take place alongside business relationships.

Should China continue its "peaceful rise" we will all benefit. However, the pace of Chinese military development entails an element of risk. Woe to any of us who believe that "trade" inoculates nations against war and conflict – history suggests the reverse.

Unfortunately, our policy for balancing and deterring Chinese military power is in disarray. The United States has not structured its forces or its policy to hold up the deter and balance component of our relationship with China over the long term.

Decisions in 2009 deliberately accepted moderate risk in US military capabilities, particularly in the air and naval forces which are vital to balance and deter in the Pacific.

Airpower is a case in point.

China has been watching US military operations and developments. They have taken note of the vital role of airpower, space power and cyber operations. Lieutenant General Liu Yazhou, of the People's Liberation Army Air Force, wrote a widely-circulated think piece in 2005. [Lieutenant General Liu Yazhou, PLAAF, "China-America: The Great Game", *Eurasian Review of Geopolitics*, January 2005.]

"I believe that air power was the decisive force for the Iraqi War, though the US sent massive ground forces as well," he said. "Air power has played a decisive role in all America's recent wars: the first Gulf War, the Kosovo War, the war in Afghanistan, the Iraqi War."

China is operating as a regional power seeking to extend its influence within its region. Some of this may be in reaction to the US posture in the region. Historians may look back on the period 1995-1996 as the turning point in China's military rise. In September 1995, China test-fired missiles in the Taiwan Strait. In December 1995, the USS *Nimitz* conducted a little-publicized transit of the Taiwan Strait. On March 10, 1996, Secretary of Defense William Perry deployed the USS *Nimitz* and the USS

Independence for operations off Taiwan. At the same time, USS *George Washington* moved from the Mediterranean into the Persian Gulf. A 1997 Navy Posture Statement echoed the conclusion, citing: “the bold movement of carriers *Nimitz* (CVN 68) and *Independence* (CV 62) into the South China Sea during March 1996 provided the appropriate level of national resolve to contain a crisis between China and Taiwan.”

Perhaps China’s commitment to increasing its military ability to lock out US and other forces dates from this incident. At any rate, China has evidently chosen to expand its military power.

I will now address what to me is the core problem from the military perspective. China’s military challenge is very straightforward. At the highest level, the strategy can simply seek to disrupt US capabilities that will be operating at extended ranges. China will have what 20th century strategist called strong interior lines of communication. In contrast, the US must reach across the Pacific with the more difficult aim of holding access open through a credible ability to withstand Chinese attacks and to hit key targets on China’s mainland. Not that anyone wants to do that – but being prepared for it is the essence of deterrence in this theater.

Chinese military doctrine recognized this point in a 2004 Defense White Paper. It stated: “The PLA Air Force is responsible for safeguarding China’s airspace security and maintaining a stable air defense posture nationwide. In order to meet the requirements of informationalized air operations, the Air Force has gradually shifted from one of territorial air defense to one of both offensive and defensive operations. Emphasis is placed on the development of new fighters, air defense and anti-missile weapons, means of information operations and Air Force automated command systems. The training of inter-disciplinary personnel is being accelerated for informationalized air operations. Combined arms and multi-type aircraft combat training is intensified to improve the capabilities in operations like air strikes, air defense, information counter-measures, early warning and reconnaissance, strategic mobility and integrated support. Efforts are being made to build a defensive air force, which is appropriate in size, sound in organization and structure and advanced in weaponry and equipment, and which possesses integrated systems and a complete array of information support and operational means.”

Two key elements stand out. First, China is shifting to more offensive capabilities, which are natural for the sophisticated application of airpower. Second, China is embarking on more of the integrated training needed to perform complex operations. The combination could give China the ability to very successfully battle against US force in the region.

Watch for these offensive capabilities to take the form of extending the range of air operations and missile attacks. Cyber attacks which can disrupt and confused deployed US forces will also be a major element. Remember that success in China’s strategy does not require occupation of territory, sinking ships or fighting to a “win” over US forces. Currently, China has a capability to significantly interfere with US air operations. Over time, the US will find it more difficult to achieve objectives such as attacks against Chinese air defenses designed to re-open access. The balance today is somewhat in the favor of the US, but China may soon be able to achieve its goals not through outright defeat of US forces but via disruption and inflicting losses which make efficient operations difficult.

Success for China can come simply from counterattacks on US aircraft, ships, satellites and cyber links that disrupt operations. For example, missile attacks against carrier strike groups may need only to disrupt operations, depressing sortie generation rates as carriers struggle to launch and recover on normal deck cycles while struggling under missile attacks. Ships do not have to be sunk or even hit in order to throw the careful choreography of naval airpower into disarray.

Fighters that do launch from land or sea bases will immediately confront the integrated air defenses and superior numbers of the PLAAF. China now possesses variants fo the Russian S-300 surface to air missile which give it at least a 75 mile range against non-stealthy attacking aircraft. Reports indicate this missile can be mounted on barge platforms at sea.

Once beyond the missile fly-out rings, US aircraft would encounter large numbers of fighters on combat air patrol. China’s fighters are not on a par with the F/A-18EF Superhornet, our more advanced

F-16s and F-15s, and certainly not with the F-22. However, numbers can parry attacks especially if China's objective is not shooting down more US aircraft, but merely hitting enough to degrade operations. Barrage air-to-air missile tactics and the ability to swarm multiple aircraft against a two-ship or four-ship of US aircraft will likely result in losses to the US. The worst case would find Chinese fighters breaking through distracted combat air patrols to reach US tankers or battlespace control aircraft. While US forces would most likely prevail, the losses would shock the public and day after day, add up to unacceptable attrition. The worse this calculation gets over the years, the less the US will be able to balance and deter in a credible manner.

US Decisions Detracting from Balance and Deterrence

Given the disadvantages in numbers and geography, the US must rely on extremely advanced capabilities to balance and deter China so that trade relations thrive in a peaceful atmosphere across the Pacific. Unfortunately, an informed Chinese military expert – or even the most casual observer – could not help but note that US defense policy has backed away from this strategy over the last two years. Key decisions stand out:

- **Trending away from advanced technology.** The articulated policy of seeking 75% solutions and turning away from so-called “exquisite” capabilities has been set against constant reminders from senior officials that America's air and naval assets outnumber others. This pointless bean counting does little to account for the fact that US air and naval forces must reach far across the globe to project power. It also does not account for the most basic rule of thumb in military strategy, which is that the attacking force must outmatch the defender by a factor of 3 or more. That can be done with superior numbers or superior capability, but it cannot be done with low numbers and “medium” capability.
- **Early termination of the F-22.** 187 F-22s under the current program will yield too few for a Pacific scenario. Consider, for example, that current plans call for just 18 F-22s stationed in Hawaii with a further two squadrons in Alaska. The F-22 has tremendous ability to outmatch China's fighters and torment its surface-to-air missiles, but numbers sufficient for 24-hour operations are not being bought.
- **Discussion of reducing aircraft carrier numbers or capabilities.** Although denied, the discussion of dropping aircraft carrier numbers must read to Pacific allies and adversaries alike as a sign of weakened commitment.
- **No new bomber program.** Secretary of Defense Robert Gates terminated the new bomber program in April 2009. While research is now under way for a so-called “family of systems,” the fact is that the Pentagon does not have a funded bomber replacement program. That will leave just 20 B-2s – perhaps 4 to 6 on any given day – available for one of the most difficult deterrence tasks: holding heavily defended enemy targets at risk.
- **Failure to acquire a new air refueling tanker.** The delayed tanker acquisition, currently a result of Pentagon decisions taken in 2008, has put power projection at risk. US and allied joint forces need tankers with the capacity, range and modern avionics to handle very tough scenarios in Pacific power projection.
- **Slow progress in streamlining military cyberspace operations.** While plans have been made for a US cyber command, the command has not stood up, and many issues remain. One suspects that the Chinese do not spend any time debating lines of control between active duty, reserve and intelligence authorities for military cyberspace operations, as we do here. It's important to get cyber right but our slow progress does nothing to aid in balancing and deterring.

Taken together, this list stands in stark contrast to the active developments by China over the same period of time. Hot topics in US defense circles such as counterinsurgency manpower, small UAVs, and renewable battlefield energy sources have little bearing on deterring China. Unfortunately, sophisticated discussion of the balance of power in the Pacific takes place only on the margins of US defense dialogue

today.

Regional Allies

Overall provisions for working with allies and assessing the fine points of the military balance with China have been given short shrift for many years. While military to military contacts have occurred, along with visits of senior defense officials, the overall program is not robust enough.

The decline of US military capability in the Pacific as a result of US defense policies has been noticed by key allies. Australia's 2009 Defence White Paper pointed out the unprecedented rise of military power in China and India and acknowledged doubts about the US security commitment to the region.

The blocked sale of the F-22 to the Japan's air force foreclosed another opportunity to strengthen regional conventional deterrence.

Vietnam is increasingly concerned about maritime patrol along its lengthy coast, much of which faces China. The 1979 Chinese invasion of the so-called "renegade southern province" was a failure but the lingering threat remains.

Any confrontation with China will put the spotlight on the strength of Taiwan's military forces. Taiwan is an important air base. However, its inventory of approximately 300 fighter aircraft is aging. Taiwan is attempting to acquire new F-16s and this sale would be of benefit to the balance of power in the region. Beyond this, US policy frowns on visits to Taiwan by senior US military and civilian leadership. This closes a good avenue for learning more of the intricacies of the region. The atrophy of some basic military exchanges with Taiwan symbolizes the overall lack of clarity about the military dimension of US policy in the Pacific.

Conclusion

A peaceful Pacific for the 21st Century depends in my view on the US military's ability to balance and deter Chinese military capabilities. The US should maintain the high-end forces capable of putting China's strategy at risk. Disparity in power benefits no one.

As General Liu pointed out in his 2005 paper: "The more solid and credible our strategy of deterrence becomes to the United States, the more careful it would be in considering forceful intervention." The US and allies must uphold its side of that balance, too.

HEARING CO-CHAIR BLUMENTHAL: Thank you.

I was going to stop you earlier, but it was almost as if I wrote the testimony myself. I didn't, just to tell my fellow Commissioners.

COMMISSIONER REINSCH: How do we know that?

HEARING CO-CHAIR BLUMENTHAL: We've never met; have we, Dr. Grant?

Mr. Hagen. Let's try to stick to the seven minutes, unless I get carried away.

STATEMENT OF MR. JEFF HAGEN SENIOR ENGINEER, THE RAND CORPORATION ARLINGTON, VIRGINIA

MR. HAGEN: I will do my best. Mr. Chairman, members of the Commission, thank you very much for the opportunity to speak with you

on this important topic.

As has been discussed, China is simultaneously modernizing several aspects of its military capabilities in ways that could pose a unique set of interlocking challenges for the U.S. military operations.

Although armed conflict between the U.S. and China is quite unlikely because it would be quite mutually destructive, there are important deterrent and stability reasons for ensuring that the U.S. is well prepared for a broad range of contingencies involving China.

Research conducted with my colleagues at RAND has highlighted three particular aspects of Chinese modernization that together hold the most potential to affect traditional U.S. power projection.

These three modernization thrusts are anti-access threats to U.S. bases, state-of-the-art surface-to-air missiles, and a fourth generation air force with precision air-to-air and air-to-ground capabilities.

Before I discuss each modernization effort specifically, it is important to recall that simply purchasing equipment does not give a military force an operational capability. Effective testing, ongoing and realistic training, sufficient support, and robust command and control of communications must accompany that equipment.

However, recently enhanced training and exercises may be signs that China has recognized these difficulties and is making efforts to address them. Despite these efforts, it is interesting to note large Chinese investments in systems such as ballistic missiles, which do not require interoperability per se, and which can be quite effective even when operating a predetermined plan and with little communication from higher headquarters.

China's inventory of tactical ballistic missiles and ground-launched cruise missiles is the core of the anti-access threat that it is creating. These two systems may soon be joined by long-range air launch cruise missiles and an air force capable of precise air-to-ground strikes.

Of the six major U.S. airbases in the region, only the most remote, Andersen Air Force Base on Guam, is currently free from threat. However, there appear to be signs of cruise missiles being fitted to H-6 bombers that could soon allow them to reach Andersen, and China clearly possesses the technology to produce conventional ballistic missiles that could reach Andersen as well.

When we compare the number of missiles required to close bases with the numbers that are currently being fielded, if China were to take the step to attack U.S. basing, our forces could face days at a time with few operating locations near China.

Coupled with anti-ship threats to Navy carrier groups at long distances, this capability could greatly limit the number of aircraft

sorties the U.S. is able to generate.

Furthermore, current trends indicate that this threat continues to increase, both in quantity and in range.

Upgrades of surface-to-air missiles and fighter aircraft are often grouped together under the term "area denial" to capture the sense of portions of battlespace being made too risky for U.S. operations. Although China has not fully modernized its air force, the air defenses and interceptors it is fielding in increasing numbers will soon pose a significant challenge to any air mission, particularly if limited U.S. sorties make large support packages difficult to create.

In the case of a China-Taiwan scenario, a key element of this area denial capability is that the threatened airspace is not only over Chinese territory but is being extended over the Taiwan Strait and soon over Taiwan itself.

This combination of anti-access and area-denial threats, if accompanied by appropriate training and support, appears quite capable of affecting traditional U.S. air operations. Whereas, in the past, we could at least match adversaries in numbers and exceed them in capability, in the near future, if U.S. basing is attacked, China is likely to be able to exceed the sorties we can generate and is beginning to approach the capability of the older fighters that make up the bulk of our forces.

Perhaps even more concerning than these practical effects is the destabilizing nature of the Chinese threat matched against traditional power projection operations.

The typical U.S. military response to rising tensions is to deploy forces, especially airpower, into the theater to deter and, if necessary, coerce an adversary. If the U.S. were free to operate from bases near China, this would likely be the case in the Pacific as well.

Thus, China may feel that its only hope for a victory is to attack U.S. forces and logistic support as they deploy into theater. The effectiveness of U.S. airpower coupled with its vulnerability in this theater has created an incentive for attack rather than stability.

Despite these rather significant obstacles, there are several steps the DoD can take to mitigate them, offer a robust set of capabilities to decision-makers and improve deterrence and stability in the region.

First, an expansion in the number of operating surfaces at island locations near Guam with hardening against rapid and comprehensive destruction would make a Chinese anti-access strategy much less effective.

Shelters for parked aircraft, sufficient runway repair teams and equipment and protected fuel would make these bases more survivable.

Other regional locations outside the main threat radius could

provide refueling support to fighters operating from this additional basing.

Second, increasing our long-range strike capability in the near and mid-terms would allow the U.S. to augment this expanded but still distant basing.

The effectiveness of the current bomber and submarine fleets could be increased, particularly by an expansion in the quantities and capabilities of long-range cruise missiles.

Third, increased coordination between the Air Force and Navy could pay high dividends given the level of threat and diversity of operations likely to be needed. For many critical missions, such as maritime interdiction and base defense, elements from both services may be needed.

This, in turn, requires that the services integrate at several different levels and perhaps take on less traditional missions in support of each other.

And finally, the services should continue modernizing from a fourth generation to a fifth generation fighter force. Although threat to bases in this region would seem to call into question large investments and fighters, the reality is somewhat more complicated.

Modern fighters provide several unique capabilities in both combat and intelligence gathering, and fifth generation aircraft are both more survivable and more effective than the current fleet.

This combination means that fewer aircraft are needed to accomplish the same missions, which is exactly what is needed in the anti-access situations.

If the U.S. wishes to remain relevant in the Pacific, we likely need to respond to Chinese modernization in an intelligent and cost effective way. Any U.S. response should be focused on increasing the deterrent effect of our force posture and providing decision-makers with a broad set of stabilizing options when faced with increasing tensions.

If properly done, important U.S. military shortcomings can be bolstered at reasonable costs and with positive effect on relations in the Western Pacific.

Thank you very much for your time, and you must have agreed because you didn't cut me off.

[The statement follows:]⁵

Panel VI: Discussion, Questions and Answers

HEARING CO-CHAIR BLUMENTHAL: Beautiful. A minuses

⁵ [Click here to read the prepared statement of Mr. Jeff Hagen](#)

both, A's both. Chairman Wortzel--or sorry--or Chairman Emeritus Wortzel had a question, and I think he needs to leave after that so he's going to go first.

COMMISSIONER WORTZEL: Thank you very much, and I want to thank both of you for some very thoughtful written testimony and good oral testimony.

But I've got a couple of questions for you, Mr. Hagen, if I might, and then Dr. Grant, if you want to comment, that would be fine.

First of all, in your testimony, you say that Guam is free from missile threat, ballistic missile threat. But do you think that's the case for a conventional warhead on a DF-31? And then if that's, I mean assuming that's a reasonable capability, not for a DF-5 but for a DF-31, that leaves Tinian and Saipan and everyplace else just as threatened as Guam would be.

And then you have another section where you discuss the need for the ability to attack deeper targets inside China in a case of conflict with conventional strikes. Now both of those things lead me to something you don't discuss at all, and so I'm going to invite you to talk about that.

The DF-31 question was kind of rhetorical. Obviously, it's quite capable of hitting that place, and it could have a conventional warhead.

You don't talk at all about escalation control. If the United States and China reach the point that there are DF-31s flying at Guam, or we have decided through some aspect, a global strike or some other system, that we're going to strike targets deep in China, how do you handle escalation control? Is that going to stay a limited conflict? Is it going to expand across the Pacific into the United States and does it stay conventional?

MR. HAGEN: Well, let me just address the Guam question first. Obviously, as I mentioned in my testimony, it's not hard to imagine, given China's ICBM capabilities, that they could certainly create ballistic missiles that can threaten Guam.

Obviously, missiles that can reach that range are going to be quite large and hence expensive, and we'd hope to see that the magnitude of threat wouldn't be as numerous as it would be at closer ranges. Typically that's what happens. So the idea of more basing near Guam is simply to dilute the number of missiles they have. Rather than a single base facing a hundred missiles, hopefully, you could have four bases facing 25 missiles. That would be the approach.

But certainly, it's certainly reasonable to expect that there could be in the future conventional attack capability against that range as well.

To address your escalation question, obviously, we've spent the day today talking about Chinese attacks on Okinawa, Japanese territory, and now Guam, U.S. territory. Obviously, to a certain extent, even at this point, escalation has gotten somewhat out of hand; right.

The question is I am not a strategist, I am a military analyst, and so the question is what would we need to do to prevail in situations where that basing has been attacked?

Certainly, you would think, and if they're willing to attack Guam, you would certainly think we might be willing to attack the Chinese mainland. They're both sovereign territories. So certainly all the military commanders in the region are very concerned about limiting the types of strikes that might be required in a situation like that. Certainly, you would like to restrict them to a relevant AOR as much as possible. Certainly you'd like to restrict them to military targets to the greatest extent possible.

But I agree with you. There certainly needs to be more thought given to exactly how a situation like that would play out. It makes it difficult. The lack of transparency just on the Chinese system makes it very difficult to even quite comprehend how they would treat a situation like that.

HEARING CO-CHAIR BLUMENTHAL: Commissioner Videnieks.

HEARING CO-CHAIR VIDENIEKS: Quick question kind of to both of you. Dr. Grant, you mentioned in your testimony that the evaluation of the balance or superiority of influence, call it--should not be exercised as bean counting.

And then, Mr. Hagen, you say that we may need, on page eight of your testimony, you say that we need more fifth generation fighters like the F-22 to maintain a favorable balance.

A favorable balance means air superiority--okay--in the region. Balance is something parallel on a fulcrum--okay--in the physical sense. How many fifth generation aircraft would we need to maintain superiority in such a way as to guarantee stability, I guess? I mean that question is to you. You're the one, I think, who mentioned the numbers, that we need more aircraft, and the question is how many?

MR. HAGEN: Sure.

HEARING CO-CHAIR VIDENIEKS: And then how does maybe one resolve the differences in testimony?

MR. HAGEN: Yes, it's obviously totally situation dependent. There are obviously smaller conflicts that you can imagine--blockades or things like that, where you would like to simply help Taiwan maintain its own air sovereignty. Maybe they don't need any help in a smaller situation like that. Maybe we're just there to protect our high value assets and that type of situation.

There are the more catastrophic situations where the Taiwanese military has little capability remaining, and we're going to have to do most of the air sovereignty role over there. If you start to think about trying to do that job from Guam, which is a very long distance away, you need several hundred fighters to do that.

You would still be outnumbered over Taiwan in a situation like that, which is why you'd like the additional capability that the fifth generation provides you.

HEARING CO-CHAIR VIDENIEKS: So my question was in the theater is one situation; globally is another situation. Their stated mission is perimeter. So I guess my question is I seem to agree with Dr. Grant, that is not a situational bean counting, per se. It's the objectives as you were saying. Any further comments on it? Do we need more fifth generation aircraft? Don't we? Or?

DR. GRANT: I would be happy to comment on that. The terminated F-22 buy clearly leaves us below a JROC approved requirement for numbers of that platform in the Pacific. As a result, we need the full planned F-35 buy in order to provide the numbers that were already planned to go in there.

My colleague is correct in saying that the real numbers are situation dependent, but we don't want--I think we have a little bit perhaps euphemistically used the word "balance"--we don't want balance in air-to-air; we want superiority. And that means that we need both the quality and the numbers, and frankly because of what will be a moderate risk in the F-22 fleet, we have a shortfall, and we therefore need every last F-35 that we can buy, both for the Air Force and for the carriers as well.

HEARING CO-CHAIR VIDENIEKS: What would the range be? How many more fifth generation aircraft would we need? Just maybe bare minimum and bliss?

MR. HAGEN: As like a total global fleet or just for this particular?

HEARING CO-CHAIR VIDENIEKS: I'll say regionally, for the regional requirements at this point.

MR. HAGEN: Well, our analysis at RAND has indicated that you would like to be prepared to deploy several hundred fifth gen fighters into this AOR if necessary.

HEARING CO-CHAIR VIDENIEKS: Thank you.

HEARING CO-CHAIR BLUMENTHAL: Thank you. Thank you both for the testimony.

So you have this problem with combat range, right, if you're saying you're basing out of Guam or Tinian or any. I understand the logic behind wanting to diversify the basing access, but then you have a

big problem with range and then needing numbers and tankers and so forth.

And then you have a problem with carrier, carrier aviation, because they have to push back, and so you have another problem with range over there. So what, what is the answer? I mean if you go to just long-range stand-off aircraft, then you have a problem with allies and credibility, I think. So when you're in this environment where Kadena and any other airbase you might fly out of is well within range of even SRBMs, how do you solve that? How do you solve that puzzle?

DR. GRANT: I want to note one thing, which is that our air forces collectively, we're very experienced in NATO in the Cold War in dealing with a very similar threat from the Soviet Union against bases in Europe right up against this. And I don't know--the RAND Corporation, where I once worked for awhile, has considerable studies on the viability of airbases. We're right to mark that threat, but let's not rule them out. There are a lot of long runways in the Pacific region.

Our challenge, as my colleague has pointed out, is to adequately defend them, diversify deployments where necessary, but to prepare to fight through, and that is why we have emphasized the numbers.

That is also very key in the arena of cyber--the question earlier about escalation. The first piece of this will be an escalation into a cyber attack that will attempt to break and disrupt capabilities and also attempt to eliminate or deny space-based communications in the theater.

So our military is already preparing to fight through with that. They're going to have to do the same with the bases. and I would not, therefore, count out the carrier fleets, and we have some extremely capable air defenses of our own. It's just going to be a situation where we have to fight through, and that's why we need the quality and the numbers we've both spoken about.

HEARING CO-CHAIR BLUMENTHAL: Anything to add, Mr. Hagen, on that?

MR. HAGEN: I think, you know, the issues you highlight is why we talk about doing more in the area of Guam. I mean if you start to lose that, in addition to bases around Japan, you start to run out of options rather quickly. You can fly fighters from locations like Australia, just to take an example, but those would be some of the longest fighter missions ever flown.

You'd have almost no loiter time over the straits. So having at least some access to bases near Guam is going to be important and obviously I agree with Dr. Grant that, you know, there are some things we can do that aren't huge amounts of money to really help ensure the access to bases out there.

In terms of what you have to do, you know, the way I like to

think about the problem is, look, the Chinese military commander has several courses of action at his disposal. I would like him to go down the list and say, well, that one is not going to work, that one is not going to work, boy, the U.S. is ready for that one, that one is not going to work.

We'd like to have some kind of robust set of capabilities across a broad range of things that China might choose to do. In the Taiwan situation specifically, you obviously worry about blockades, both air and sea. We've talked about TBM attacks on Taiwan. Obviously, we worry about air attack against Taiwan, and then we all worry about an amphibious invasion against Taiwan at some point perhaps.

One of the more difficult--obviously, the TBMs are very difficult to go after--mobile targets. You start to think about going after the infrastructure of the whole TBM--reloads and command and control, things like that.

In terms of air attacks against Taiwan, which quite frankly is the center of gravity-- right--I mean the TBMs is a thousand weapons. They're about 1,000 pound bombs. They're not terribly accurate. You know, in the sense of historic strategic bombing campaigns, that's really not much at all.

The center of gravity turns into the aircraft attacks, and you really have to think about suppressing some of their airbases, and so as you can see from my comments, we're in this world of thinking about what kind of targets on the Chinese mainland do we have to strike?

HEARING CO-CHAIR BLUMENTHAL: Just a quick follow-up. You mentioned NATO. There's a lot of capability among our allies in the Asia-Pacific. Do either of you assume allied partnership in any conflict? It seems like we're so fragmented on our allies. We don't know how to assess the balance if you add the allied capability in, in TAC air and other kinds of airpower.

DR. GRANT: I'm not sure that we've formally added in enough, and we probably need a better policy to understand what we expect from our allies and to guide our relationships and military sales accordingly, but I think we're certainly counting on some participation from that quarter, and there are some very capable air forces in the Pacific that could be very key partners depending on the situation.

MR. HAGEN: Yes. Japan, obviously, has a very capable military. They could obviously contribute to a lot of air defense missions. Obviously, the politics are quite complicated as we're currently seeing. Obviously, the Taiwanese military is quite capable in many aspects. There are things that they could do differently perhaps to be better, to ease some of our burden, but that's obviously up to them.

Other partners in the region, you just start to worry about how

much, again, I'll just go back to my experience as a military analyst, in terms of robustness, being prepared for--I don't want to call it the worst case, but you have to be prepared for a lot of different cases, and it's just difficult to depend on basing access and other types of support in a conflict here.

Countries in that region may just want to be studiously neutral in any kind of conflict here. So--

HEARING CO-CHAIR BLUMENTHAL: Well, then they're not allies. But anyway, Pat.

COMMISSIONER MULLOY: Thank you, Mr. Chairman.

Dr. Grant, you're part of the Lexington Institute.

DR. GRANT: Just a correction. Of the Mitchell Institute of the Air Force Association.

COMMISSIONER MULLOY: Okay. Now, in your testimony on page one, you talk about "woe to any of us who believe that trade inoculates nations against war and conflict."

I remember ten years ago, the President's National Security Advisor Sandy Berger said that it was, quote, "in our national security interests to bring China into the WTO," because he thought bringing them into the global economic system was very important in terms of keeping them behaving properly, et cetera.

And you're saying that doesn't inoculate you. Your institute--Dr. Loren Thompson wrote a recent study--are you familiar with that study--about the decline of the American defense industrial Base?

We've had testimony before this Commission that the Chinese have some policies in place to incentivize American corporations to move manufacturing from here to there, and once the manufacturing begins to move, the R&D associated with manufacturing moves, and that this hurts our overall economic base but also our defense industrial base.

Do you think that's a correct view?

DR. GRANT: There's no question but that Chinese manufacturing plays a major role. I would add to your examples the fact that China has made quite a lot of progress in smart grid technologies and in wind power.

The reason I flagged this in my testimony really was a little different, and that is to make the point that sometimes we become so enmeshed in our discussions of China and trade, and we know it is an important global partner, that I feel sometimes preempts or removes the legitimacy from the discussion of the military relationship as well.

And I wanted to make the point to the Commission that while we have our economic relationship, which I hope will grow and prosper, that we also have a military relationship, and it is increasingly hard, I find in this town, but not in this room, to discuss the specifics of that,

and you will often hear experts say it's not--discussing deterring China is not a legitimate scenario because we trade with them.

And that is why I point out that many trading partners, such as the belligerents of World War I, have gone into pretty serious conflict with each other.

COMMISSIONER MULLOY: I think that's very helpful. And then you further say that, you know, that "our policy for balancing and deterring China's military power is in disarray."

What do you think would be a realistic--I hear the same thing. We have this economic relationship, we don't want to talk about these other issues because we're in favor of an engagement policy with China.

You point out that our policy is in disarray. What do you think our policy in integrating all of this should be? Do you have ideas of what we should be doing?

DR. GRANT: I would say two steps, and the first is to clarify our military and strategic policies, to clarify what, that we will deter China, and what we will do in order to do that, instead of simply dismissing that scenario or focusing on other elements of our defense policy. Our defense policy is not complete until we lay out a clear strategy for deterring China.

Secondly, how to integrate those two. Very much so that will become, I think, a major task of our State and Defense and Commerce and other departments throughout this century. I think we as Americans are going to have to live with the duality of deterring a trade partner, something that we have not much had to do certainly in my lifetime. You're either good or bad; we trade or don't trade. And we need to learn to live with the complexity, that is, it is a rising and powerful China.

COMMISSIONER MULLOY: Do you have anything to add to that, Mr. Hagen?

MR. HAGEN: I don't. I don't.

COMMISSIONER MULLOY: Okay. Thank you. Thank you very much.

HEARING CO-CHAIR BLUMENTHAL: Thank you very much to our panelists. It was a terrific end, right on time. Thank you to the Commissioners for good questions, and thank you, again, very much to the staff without whom this couldn't have happened, and to my co-chair, Peter Videnieks. Thanks. We're adjourned.

COMMISSIONER MULLOY: Thank the Chairman and the Vice Chair of the hearing for a great job. Thank you.

[Whereupon, at 4:00 p.m., the hearing was adjourned.]

ADDITIONAL MATERIAL SUPPLIED FOR THE RECORD

Statement of Phil Gingrey, a U.S. Representative from the State of Georgia

Commissioner Videnieks, Commissioner Blumenthal, and Members of the Commission, I appreciate this opportunity to testify before you today and would once again like to commend you for the important work of the Commission in analyzing the economic and security relations between the U.S. and China. Accordingly, I am pleased to be able to share my thoughts with you especially as the Co-Chair of the House of Representatives Taiwan Caucus.

Your hearing today on China's Military Aerospace and Commercial Aviation Capabilities is a critically important topic that provokes not only questions of Asian regional relations but also of U.S. aerospace superiority.

There is an old saying that "good fences make for good neighbors." Well, I would like to offer a variant of that saying: "good defenses make for good neighbors." Establishing defensive parity among nations has been one mechanism to prioritize diplomatic interaction over military recourse. As we look to Eastern Asia, the explosive growth of China and its increasing investment in its military necessitates our consideration of the defensive capabilities of their neighbors. I do not say this to ascribe motive or impugn the actions of China, but rather, I say this because again, the preservation of defensive parity is key to preserving peaceful interactions in all regions of the world.

These sales are critically important for several reasons. Outside of the F-16, Taiwan's current fleet consists of F-5s, Indigenous Defense Fighters, and Mirage 2000 Fighters. The F-5s are aging rapidly, while the Mirage 2000 fleet will have to be retired in 2010 due to the lack of affordable spare parts. The Indigenous Defense Fighters are expected to reach the end of their service life by 2020. Without new F-16s, in the next 5 years the Taiwanese fleet will be reduced by 120 aircraft. It is clear that new F-16Cs would enable Taiwan to maintain a sufficient self-defense and ensure cross-strait stability through air parity.

Further, we must not only work to ensure cross-strait stability, but regional stability as well. One way to accomplish this is by exploring the sale of the F-22 Raptor to Japan. This makes sense for several reasons, mainly because we know other regional powers — namely the Chinese and the Russians — are currently test flying and committed to fielding the T-50, which is quite obviously an F-22 Raptor-like aircraft. In the past, the top admiral in the Chinese navy discussed their development of a stealthy fighter capable of

supercruise. Further, sophisticated and highly lethal missile systems such as the SA-20 and S-300/400 are proliferating worldwide.

Additionally, since the United States is poised to terminate F-22 production nearly 200 aircraft shy of the Air Force's validated requirement for 381 Raptors, a Japanese Self Defense Air Force equipped with an FMS version of the F-22 would demonstrate, without question, our real commitment to a key ally, Japan, while allowing the U.S. to position more of our limited USAF F-22 fleet in other areas.

Ultimately, foreign sales of the F-16 and the F-22 to our allies in the region will help to preserve a military balance of power in the region that will actually do more to preserve peace and foster cooperation than to upset it. Further at a time of growing U.S. deficits, foreign sales are a pragmatic approach to preserving this balance of power in the region without doing so at the cost of the American taxpayer.

In conclusion, I want to again thank this Commission for its work and express my optimism that the fruits of its labor will promote sound and solid policymaking here in Washington. Thank you.

PUBLIC COMMENT [as received]

We need to cut out most trade with china. they are sending us poison after poison after poison. their actions have cost many many american companies to go out of business. the trade with china is hurting the united states. we need to make more products here in america. we have the right to do that. stop all the ships cming from china to america. they are a very bad society, and kill people at the drop of a hat. they are also brutal to animals. we should not be relying on this country. such reliance is extremely bad for america, which must make itself strong. if we dont, i see an end to america. we are pursuing very very poor govt policies these days. cut the trade with china. now.

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