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The Future of United States – Chinese Space Relations

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Abstract

In recent years the U.S. space program has been in decline, mostly due to budget cuts. Because of those reductions, NASA is struggling to fund its space exploration programs. One solution to this problem is to collaborate with other space agencies to share the cost and the knowledge gained. The Chinese have recently put a lot of effort into becoming a global space power and are willing to collaborate with other agencies in their space exploration efforts. The United States, however, is very reluctant to enter into any type of collaborative effort with the Chinese for a host of reasons. In order to gain greater insight into this issue, a survey will be conducted using the following three control groups: 1) individuals affiliated with the U.S. space program and related agencies, 2) individuals affiliated with the U.S. military and related security agencies, and 3) individuals not affiliated with either group previously mentioned. It is believed that these three groups will give a good indication of the general feelings of the United States population towards cooperating with the Chinese in spaceflight and what obstacles need to be overcome. The central research questions will focus on whether the participants believe the United States should collaborate with the Chinese, what they believe are the main objectives of the Chinese space program, and what issues need to be addressed before collaboration is possible. The author predicts that the individuals affiliated with the space program and those of the military will be diametrically opposed to one another while most of the general public will support collaboration.

Keywords: NASA, Chinese, Collaboration

1. Introduction:

For many years the United States has been a world leader in space exploration. NASA not only develops its own space missions, but it has taken the opportunity to collaborate with other countries and space agencies. Although the U.S. has worked with other countries, it is reluctant to collaborate with the Chinese in space exploration for a host of reasons. Since the end of the Cold War, the U.S. and the Russians have scaled back their space programs mostly due to budget constraints, while the Chinese are surging forward. Even though the Chinese are still decades behind in the space program, they are striving not only to become the world leader in space exploration but to dominate space itself.[2] Currently the Chinese are collaborating with other countries such as Russia, Brazil, France, and Germany and with the European Space Agency (ESA) in their space endeavors.[6] The U.S. however, enacted Public Law 112-10, Public Law 101-246 and Public Law 106-391 to suspend all bilateral activities between NASA and the Chinese in spaceflight projects. International space partners of the U.S. however, see the great potential of working with the Chinese. So why then is the U.S. government so reluctant to collaborate with the Chinese on future space endeavors when it appears to be in its best interest to do so?

In order to fully understand the reasons for or against collaboration, a survey was conducted to help identify what some of those reasons might be. Three groups of people were selected to participate in this study: past and present members of the military and security-related agencies, members of spaceflight-oriented companies and agencies,

and members of the general population not affiliated with either group. Members of each group were asked to give their opinions on whether or not the U.S. should engage with the Chinese in space exploration.

With the winding down of the U.S. space program – a direct result of budget cuts – the overall expectation of the study was that it would reflect a general acceptance of collaboration with the Chinese. One reason for the expected acceptance can be linked to the financial potential of such a merger. It is estimated that the Chinese have at least $3.45 trillion in foreign exchange reserves that could be allocated to further space exploration should the Chinese government be so engaged.[13] The results of the survey were noteworthy because they indicated that, while a small majority of the military participants were reluctant to have any affiliation with the Chinese due to the potential harm it could cause to national security, the participants associated with the space program embraced the opportunity and were more amenable to cooperating for the betterment of science. The general population favored the small majority of military participants and leaned towards non-collaboration.

2. Study Design and Methodology:

Participants for this study were selected from three areas:

- People affiliated with the space program and associated agencies.
- People affiliated with the military and related security agencies.
- The general public not affiliated with either group.

The groups were further identified by sex and age group. The age groups were:

- Age Group A: Ages 18-30
- Age Group B: Ages 31-40
- Age Group C: Ages 41-65

For this survey, e-mails were sent to individuals known to the author until a total of 10 people in each group responded for a total of 30 participants. Of those 30 individuals, 21 were male and 9 were female. There were 4 respondents from Age Group A, 18 from Age Group B, and 8 from Age Group C. Each of the 30 individuals was asked to give his or her opinion on the following questions:

1) Do you believe that the United States should collaborate with the Chinese in outer space programs?
2) What do you believe are the main objectives of the Chinese space program?
3) Are there any issues you think should be addressed about the Chinese expanding their space program?

For research of this nature, it was decided that a qualitative method be used so that open-ended questions could be addressed. The reason for using this method is because very little information could be found in the literature about the attitudes and views of collaborating with the Chinese, which is so important to the future of the space program. Open-ended questions would allow any number of issues to surface and not limit participants to perhaps biased attitudes. Because this survey was designed to ascertain the underlying reasons for or against collaboration with the Chinese, open-ended questions allowed participants to use well thought-out reasoning in their responses.

3. Hypothesis:

It was expected that the responses from the three control groups would give a broad overview of the problems facing collaboration efforts between the U.S. and China. Based in part on past research, the author hypothesized that the military group and the space group would be diametrically opposed to one another while the general public would be supportive due to monetary motives and due to the interest in space developed by NASA through projects such as the Hubble Space Telescope and others. The media has played a significant role in creating interest in the space program as well. As a result of these and other reasons, it was expected that the general public would welcome any opportunity to return to space including working with the Chinese.

4. Results:

The results of this survey showed that 90% of the participants in the space group were supportive of collaboration. In the military group, 60% were against collaboration while 70% of the general public expressed an unwillingness to participate with the Chinese. Though the responses from the space group were expected, those from the military and general public were contrary to the original hypothesis. While the general public did express a positive attitude toward the space program itself, distrust of the Chinese and their motives was a major concern. (See Chart 1.)

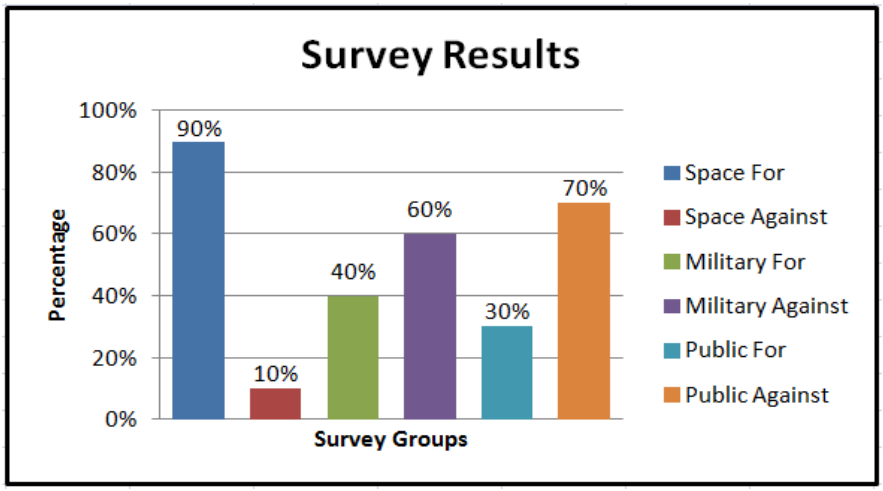

Chart 1: Complete survey results for all groups

As can be seen from the chart, the participants in the space program and those of the military program are not totally opposed to each other as predicted. Of the participants polled in the spaceflight group, 90% would welcome interaction with the Chinese compared to 40% of the military personnel. One of the military proponents of collaboration said that the best way to make sure China doesn't try to pull a military takeover of space is to work with them. He stated that we need to "keep our friends close and our enemies closer." Another participant stated that the Chinese are going to develop their space program with or without the U.S., so collaboration should limit their military plans for space and reallocate the money and talent for missions to the moon and possibly to Mars.

One unexpected result of this survey was the expression of the general public's opposition to collaboration, especially in light of the job opportunities that such an alliance would create. For example, during the Space Shuttle era, NASA was able to provide over 25,000 high paying jobs.[5] A joint mission to the moon or Mars would most likely provide at least as many. One survey question was used to determine what reasons influenced the decisions for or against collaboration. Those reasons range from technology transfer concerns to a general mistrust of the People's Liberation Army's involvement in their space program. (See Chart 2.)

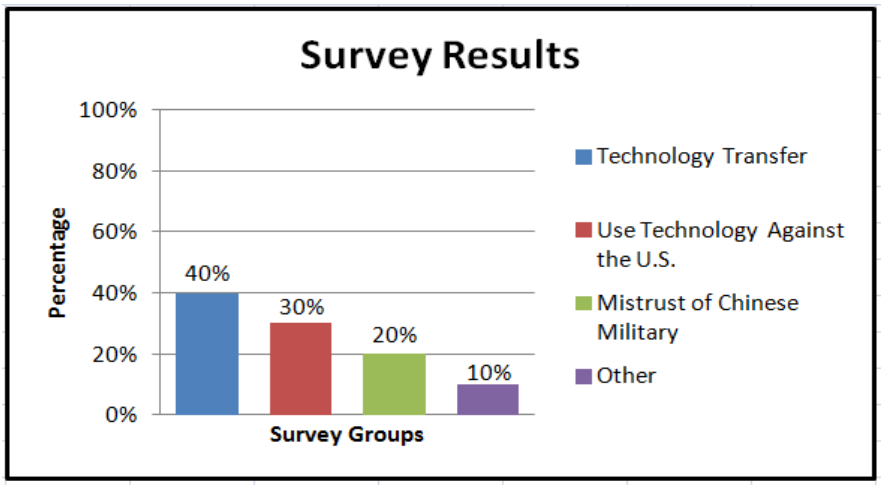

Chart 2: Reasons against collaboration

As can be seen, the top overall reason for non-collaboration is the fear of U.S. space technology being stolen or compromised. The feeling among 40% of the participants is that the technology the U.S. has developed over the past 50 years for spaceflight should be proprietary and not shared with China. Another 30% of the participants believe that the Chinese will take the shared technology and use it against the U.S. militarily. For example, one participant stated, "Clearly, technology transfers on a space program could be used directly in either espionage or weapons technology." Another participant agreed that "The U.S. must be careful of the space technologies exposed to the Chinese because they can and probably will reverse engineer the technology to improve their military capabilities."

One issue emerged from this part of the survey that was interesting, unexpected, and worthy of mention. In analyzing the responses from the military participants, it became clear that there were differences in responses for non-collaboration based on the ages of the participants. The survey showed that 40% of the military participants that thought collaboration would be good for the country were 30 years of age or younger. The 60% that did not want collaboration were mostly older people who had served in either the Vietnam or Korean wars. Of those war veterans who agreed to talk about their reasons behind non-collaboration, it became clear that their feelings ran deep based on previous experience. The Chinese were heavily involved in the Korean conflict though more moderately in Vietnam. One of the Korean War veteran participants was so devastated by his experiences with the Chinese in the war that he was not able to verbally express his reasons against collaboration. The Chinese involvement in both conflicts seems to have had a demoralizing effect on the war veterans that had to fight against them. A Korean War veteran explained, "I fought the Chinese; I know the Chinese military. Their efforts to collaborate with the U.S. can only be based on what is best for them and their military ambitions, not for peaceful purposes."

Initially, 10 people from each group were recruited for this study. To further understand this significant age-related development in research, another 10 people from Age Group C (41-65) of the survey were added to the military group to get a better understanding of the underlying reasons against collaboration. Based on the responses given, it seems that military involvement with the Chinese in war was the motivating factor governing their decision not to collaborate with the Chinese in any spaceflight endeavors. Deception by the PLA was a major concern among those polled. They felt that no matter what the stated intentions are by the Chinese, the PLA would somehow have ulterior motives and would pursue those motives through deception. One participant quoted Sun Tzu by saying "All warfare is based on deception."[14] The participant felt that the Chinese's desire to work with the U.S. in space is just a deceptive move designed by the PLA and that any collaborative agreement would be for "purely financial, technological, and military benefit against the U.S. to dominate the Pacific Rim and exclude the U.S. influence." However, further research would need to be conducted in order to substantiate the assumption.

The differences in opinions between age groups should be recognized and taken seriously. However, as time passes and the personnel that served in Vietnam and Korea retire, those differences may become less of an issue. The survey shows that the younger people are more supportive of collaboration; so in the near future, those positive attitudes could help collaboration become a reality.

From those participants that felt that the U.S. should collaborate with the Chinese, the reasons are positive but cautious. (See Chart 3.)

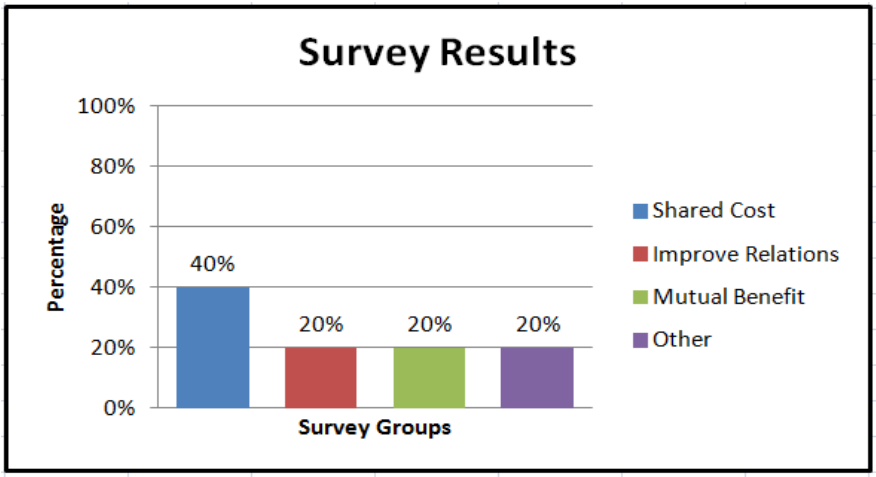

Chart 3: Reasons for collaboration

From this chart it can be seen that 40% of the participants believe that sharing the cost of space exploration is a top issue. Since NASA's budget has been cut, the number of programs to work on and the number of jobs available has decreased. Recent estimates indicate that as many as 39,000 jobs will be lost due to the budget cuts.[8] Collaboration with the Chinese would conceivably mean that the gap would be closed and there would be more work and more jobs for U.S. citizens. If the U.S. were to engage with the Chinese, the conclusion would be that it would be mutually beneficial. Some 20% of the participants believe that both countries would stand to benefit from a joint space program. One respondent suggested that the Chinese would benefit from the vast experience possessed by the U.S. space program while the U.S. would benefit by the space science, aerospace/flight technology and funding resources that China could provide.

An interesting reason that was promoted by 20% of the participants was that collaboration would improve relations between the two countries. Indeed, if the U.S. were to collaborate with the Chinese, then it would be in a greater position to monitor what the Chinese are doing in their space program and what the PLA's designs are with respect to military operations in space. A politician who responded to the survey indicated that if the two countries were to work together, relations would have to improve in order to maintain that collaboration.

Of the remaining 20% of the participants, the majority included military participants and as such, it came as no surprise that their reason for collaboration is to keep watch over the Chinese military space program. In theory, the best way to know the PLA's space ambitions is to work with their civilian counterparts in their space program. That way it would be difficult for the PLA to hide any intentions on the militarization of space.

5. Concerns:

One issue identified from the survey was that the general public and the military both were concerned about giving space technology to the Chinese. This would in fact be a poor decision, not just because of the fear of compromising U.S. space technology, but for the harm it would do to science. The Chinese have brilliant scientists and they should be allowed to develop their own spaceflight technology using state-of-the-art designs and available technology. They should also be allowed and encouraged to develop their own technology as opposed to using U.S. technology specifically designed for the U.S. space systems and not for those of the Chinese. By giving U.S. space technology to the Chinese, it deprives them of the opportunity to use innovation and creativity in their systems design. Innovation and creativity are where new inventions, processes and ideas are generated. If the U.S. gives the Chinese space technology, it robs them of that great opportunity.

The principal obstacle preventing collaboration may be the Chinese themselves. The Chinese space program is operated by the People's Liberation Army. Because of this fact, the Chinese are very secretive about their space operations. They are not as open with their space program as the U.S. is, and they refuse to allow the U.S. to visit any of their launch sites. Furthermore, it seems that there is always a story in the news of some Chinese espionage case, some of which are directed towards hacking operations to get U.S. space technology.[3,4,10] In a report to congress, it was determined that the Chinese military has been conducting hacking activities on U.S. satellites. On October 20, 2007, LandSat-7 experienced over 12 minutes of interference and on June 20, 2008, the Terra EOS

satellite experienced approximately 9 minutes of interference. These attacks were attributed to the Chinese based on authoritative Chinese military writings.[15]

There is also a justifiable fear that the Chinese are trying to militarize space. General Xu Qiliang stated that competition between military forces is going to extend beyond our atmosphere and into outer space.[2] Though his statement was later retracted at the urging of President Hu Jintao, it still creates cause for great concern. The U.S.-China Economic and Security Review Commission's opinion is that China is seeking to attain space supremacy.[15] This is evidenced by the Chinese Anti-Satellite (ASAT) weapon used on January 11, 2007, to destroy an old Chinese weather satellite. However, even though the Chinese are engaging in hacking operations, predicting that military operations will extend to outer space, and engaging in their ASAT test, the Chinese still insist that their interest in space is for peaceful purposes. To that end, James Lewis stated, "You can't say for 10 years our intentions in space are peaceful, and then suddenly blow up a satellite."[7] How to deal with the Chinese military seems to be the primary underlying issue to overcome before any collaboration can even be attempted.

6. Conclusions:

In conclusion, the results of this study showed that as long as the U.S. and the Chinese believe each other to be possible military foes, it is quite unlikely that they will fully cooperate in space exploration projects. However, as this study also showed, people in the space program are committed to working with the Chinese in space exploration. The military participants have their reservations but have also given good reasons for collaboration, especially on a mission to the moon or Mars. It is because of those reasons that the U.S. may be forced to work with the Chinese whether the government wants to or not. The Chinese space program is operated by the Red Army, so if the Chinese do succeed in landing a man on the moon and building a settlement there, that would constitute a military threat in the eyes of the government. The U.S. would then be forced to revive the moon mission plans as a countermeasure. The feeling among the military participants is that we should work with them to begin with and avert any type of potential conflict that might arise from the Chinese getting there first.

The research shows that from a monetary standpoint, participants believe that the U.S. would stand to benefit greatly from joint programs. The Chinese have a considerable amount of money to put into the space program and their leadership has shown that they are willing to use that money as needed to develop their spaceflight technologies. The willingness of the Chinese to collaborate with the U.S. can help fund more projects for the U.S. space program.

The military participants feel that cooperation will allow the U.S. to keep track of the Chinese military engagement in the space program. If the U.S. is in full collaboration with the Chinese, it will force their military to be more open about their designs with regards to the militarization of space.

In terms of space exploration, research seems to suggest that the only way the U.S. is going to get to the moon and beyond is for the effort to be global. The Chinese have set the goal of landing people on the moon. Their Lunar Exploration Project[17] has already discovered reserves of Helium-3 on the moon which can be used to refuel propulsions systems on human spaceflight missions to Mars.[18] Apollo 17 astronaut, Dr. Harrison Schmitt, stated that we should "go back [to the moon] and establish a settlement for the production of the Helium-3 fusion fuel as well as to continue exploration"[12]. It is doubtful that it will ever happen unless it is a global effort, and that includes the Chinese.

An interesting observation is that it seems like history is repeating itself. In the decade of the 1960s during the U.S.-Soviet Space Race, the U.S. had similar issues with the Soviet Union. There was a general period of mistrust and outright hostility due to incidents such as the downing of the U-2 spy plane and the Cuban Missile Crisis in which each side tried to acquire the technology of the other.[9] However, in spite of those issues, it was decided that the U.S. should be collaborating with the Soviets for some of the same reasons mentioned in this study to collaborate with the Chinese. That collaboration began with joint biological research projects in space which gave birth to a new era of "Détente."[11] That joint research led to the Apollo-Soyuz docking mission and eventually to the highly successful International Space Station (ISS). Collaboration with the Russians provided great insight into their space program that the U.S. otherwise might not have had. For the ISS, that collaboration was vital to the science projects and its continued success. The record shows that collaboration with the Soviets has led to a much more open Russia. If past history is any indication, then the success of the U.S.-Soviet collaboration in space should foster hope for the same result with the Chinese.

NASA administrator Charles Bolden stated, "Looking back on our Nation's history with the Soviet Union, the Apollo-Soyuz Test Program successfully demonstrated that, while other significant difficulties in the relations

between our two nations existed, we could in fact successfully and responsibly work together if we were both committed to doing so."[1] U.S./Russian spaceflight history shows that this will work, but again, it must start with the U.S. space program leading the way.

Currently there are strong opinions in Congress for not collaborating with China, mostly due to civil rights issues. However, when asked what it would take to get the U.S. government to agree to work with the Chinese, former NASA shuttle astronaut Colonel Carl Walz[16] stated that, "the key is developing a series of stepping stones to collaboration, starting with human and biological research. That would open a Chinese/US dialog." Walz continued, "Ultimately, there is an overall geo-political imperative that would drive such a mission. The era of 'Détente' resulted in the Apollo-Soyuz mission. I don't think we have had the corresponding event/era with respect to China."

NASA director Charles Bolden also stated, "I believe, however, that some level of engagement with China in space-related areas in the future can form the basis for dialogue and cooperation in a manner that is consistent with the national interests of both our countries, when based on the principles of transparency, reciprocity, and mutual benefit."[1]

Maybe the U.S. simply needs a good reason to engage with the Chinese: a new challenge. As one participant put it, "Perhaps collaboration is not a matter of us giving them [the Chinese] our knowledge, but it might be them giving us the challenge and motivation to think outside the box and resurrect the old American values and 'can-do' attitude in order to make it happen."

Colonel Carl Walz[16] said, "I would like to go back to space – but I think a joint mission with the Chinese will be pretty far in the future." This report indicates that if the U.S. accepts this new challenge, and a new era of Détente can be realized, then perhaps that future will not be so far off after all.

7. Acknowledgments:

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8. References:

1. Bolden, C. (2011). *Efforts to Transfer America's Leading Edge Science to China*. Washington, D.C.: Retrieved from http://archives.republicans.foreignaffairs.house.gov/112/71037.pdf.
2. Chang, G. G. (2009). The Space Arms Race Begins, from http://www.forbes.com/2009/11/05/space-arms-race-china-united-states-opinions-columnists-gordon-g-chang.html
3. Chinese-Born Engineer Guilty In Economic-Espionage Case. (2009). [Article]. *Wall Street Journal - Eastern Edition, 254*(14), A4.
4. Davis, P. (2010). Chinese Espionage Is On The Rise In The United States. *Journal of Counterterrorism & Homeland Security International, 16*(4), 12.
5. Goehlich, R. A. The Potential for International Collaboration on Manned Space Transportation Systems to the Moon and Mars. Retrieved from http://www.robert-goehlich.de/downloads/pub_paper07_Moon_Mars_Rocket.pdf
6. Huang, W. C. (2011). China's Space Capabilities and Their Regional Security Implications: DTIC Document. Retrieved from http://www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA547241
7. Lewis, J. (Producer). (2008). Decision 2008: China's Anti-Satellite Weapons Launch. Retrieved from http://csis.org/multimedia/audio-decision-2008-chinas-anti-satellite-weapons-launch
8. Machay, M. (2012). A brief analysis of US space employment. *Space Policy*, Great Britain. ISSN 0265-9646, 2012, vol. 28, no. 2, pp. 125-129.
9. Roald Sagdeev, S. E. (1991). United States-Soviet Space Cooperation during the Cold War, from http://www.nasa.gov/50th/50th_magazine/coldWarCoOp.html

10. Rodgers, J. (2012). Indictment issued in satellite parts-smuggling case: Gazette, The (Colorado Springs, CO).
11. Ross-Nazzal, J. (2010). Détente on Earth and in Space: The Apollo- Soyuz Test Project. [Article]. *OAH Magazine of History*, *24*(3), 29.
12. Schmitt, H. H. (February 2013). [Personal Communication].
13. Shiyun, Y., & Dongmei, L. (2012). Analysis and Forecast about China's Foreign Exchange Reserves Based on Grey System. [Article]. *Asian Social Science*, *8*(2), 153-158. DOI: 10.5539/ass.v8n2p153
14. Sun, t., Sawyer, R., Sawyer, M.-c., & Sun, P. (1996). *The complete art of war / Sun-tzu, Sun Pin ; translated, with historical introduction and commentary, by Ralph D. Sawyer ; with the collaboration of Mei-chun Lee Sawyer*: Boulder, Colo. : Westview Press, 1996.
15. U.S.-China, E. a. S. R. C. (2011). *2011 Report to Congress of the U.S.-China Economic and Security Review Commission*. Washington DC: U.S. Government Printing Office Retrieved from http://www.uscc.gov/annual_report/2011/annual_report_full_11.pdf.
16. Walz, C. (November 2012). [Personal Communication]
17. Yue, Z., Xie, H., Liu, J., & Ouyang, Z. (2007). An introduction of Chinese lunar exploration program. *Abstracts of Papers Submitted to the Lunar and Planetary Science Conference*, *38*, @Abstract2082-@Abstract2082.
18. Zheng, Y., Ouyang, Z., & Blewett, D. T. (2008). Implanted helium-3 abundance distribution on the Moon. *Abstracts of Papers Submitted to the Lunar and Planetary Science Conference*, *39*, @Abstract1049-@Abstract1049.