

Dynamics Engineering: A Call to Serve

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Spacecraft and Launch Vehicle Dynamic Environments Workshop



Introduction



- America's space priorities are in a state of flux, rocked by changing political and economic realities
- The future of manned spaceflight and inter-planetary exploration is unclear
- In the midst of this uncertainty, some new opportunities are emerging while many traditional ones are ending



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Altruism



- For the space program to survive and thrive, new alliances are needed between competing interests
- NASA, private industry, and individual engineers must act in an altruistic manner to advance the interests of the space program as a whole
- Furthering the interests of others ultimately serves ones own self-interest
- This presentation will give recommendations for the dynamics engineer



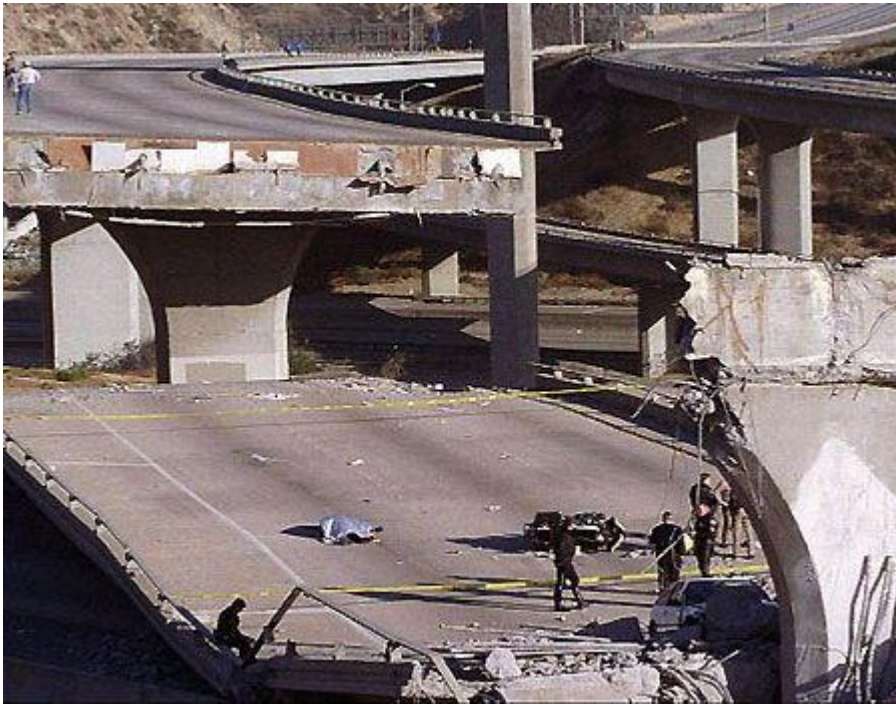
Reciprocal Altruism



- Reciprocal altruism refers to the exchange of beneficial acts between individuals, in which the benefits to the recipient exceed the cost to the giver
- Vervet monkeys have three alarm distinct calls for leopards, snakes, eagles
- An individual monkey puts himself at risk when he sounds the alarm because he draws the predator's attention in so doing
- But he protects his troop with the alarm
- The individual instinctively knows his fellow monkeys will return the favor someday



1994 Northridge Earthquake



- Northridge, northwest of Los Angeles, California
- Occurred on January 17, 1994, at 4:31 am local time
- The earthquake had a "strong" moment magnitude of 6.7
- The ground acceleration was one of the highest ever instrumentally recorded in an urban area in North America, measuring 1.8 G.



1994 Northridge Earthquake (cont.)

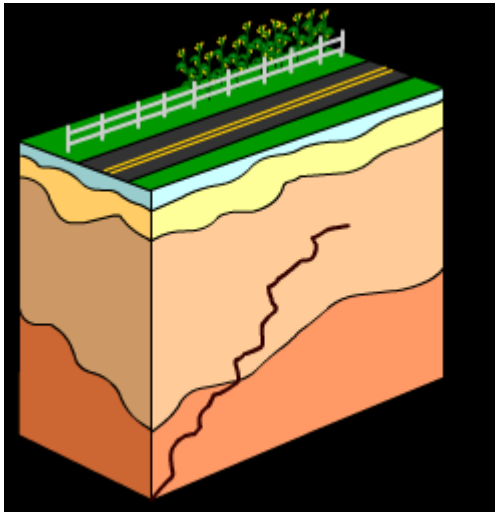


- Collapsed Parking Structure, California State University at Northridge
- About 60 people were killed
- More than 8700 were injured including 1600 that required hospitalization

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Source Location



- The source was a *previously unknown* “blind fault” nine miles below Northridge
- Also seismic energy was focused by a 1.8-mile-wide depression beneath the southern edge of the Santa Monica Mountains
- The U.S. Geological Survey afterward identified these features using oil company data taken before the quake!

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Source Location



Olive View Hospital after
1971 Quake

- Los Angeles Basin had already experienced:

1933 Long Beach Quake, Magnitude 6.4,
Epicenter: Offshore Newport-Inglewood Fault

1971 San Fernando Quake, Magnitude 6.6,
Epicenter: San Fernando Fault Zone, San Gabriel
Mountains
- But the Northridge Hospitals & Emergency
Responders could have been better prepared for
the 1994 Quake if they had know that a blind fault
was located directly under their city!



A Quixotic Paradox . . .

“The giving” of data, software, methodologies and “lessons learned” to the greater community will cost the giver in the short-run because he loses potential profit and may even give competitors an advantage.

But in the long run, the giver receives intangible benefits such as goodwill, respect, and trust which will later paradoxically lead to greater financial reward than if he tried to profit by keeping the tool himself.

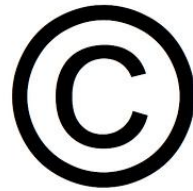
Altruism is a long-term, profit-driven strategy based on community service.

People who develop open source software understand this.

So what can the individual dynamics engineer do?



Barriers, Part I



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Sensitive But Unclassified

Company Proprietary

FOUO (For Official Use Only)

Security is necessary, especially in the post 9/11 world.

But are some barriers counterproductive in the civilian space world?

Barriers will always exist, but lets work to remove the unnecessary ones.

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A Homily



Everything I needed to know about being a good dynamics engineer, I learned in kindergarten!

Share Toys

Play Well with Others

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A Homily (cont)



Be Nice

Help Others

Teach others what you know

Be a mentor

Docendo discimus - Latin "by teaching, we learn"

Seneca the Younger (c. 4 BC – 65 AD)

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For Experienced Presenters

Assume that you present a conference paper:

Nonlinear Corcos Coefficients for Force Limited Testing where Damping is the Largest Uncertainty Factor for Nonstationary Random Vibration Environments using Pseudo Velocity Wavelets



AP / Paul Sakuma



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For Experienced Presenters



Write an accompanying primer explaining the basic principles underlying your hyper-esoteric paper!

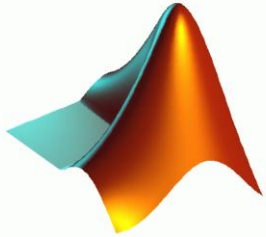
Your primer will be a greater contribution to the community than your main presentation!

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For Experienced Presenters.....

If you wrote software for the calculations in your paper.... Share it!



Your recipients will help you improve it! Free peer review!

And you will gain recognition for being the creator!



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For Young Engineers....

Share your expertise on blogs, social media, and Wikis.

You will serve the community and gain recognition.



WORDPRESS



LinkedIn



iContact
We Simplify Communication™



AEROSPACE



Barriers, Part II



But I don't have time!

Yes, you do.

Write your own generic, shareable reference documents and software for your projects as you go along.

If you complete a project early, then use the remaining allocated hours to write peripheral, shareable software and tutorials.

Ask for forgiveness, not permission!

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Inspirational Quotes



***As you begin creating
software, papers,
methodologies and training
materials for others....***

"The longest journey starts with
a single step" Lao-tzu



Inspirational Quotes



“That which we persist in doing becomes easier to do, not that the nature of the thing has changed, but our power to do so is increased.”

- Heber J. Grant (1856–1945)

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Conclusion



- *Let's keep the dream of space exploration alive by embracing change and new opportunities*
- *Share our knowledge!*
- *Have fun!*

SCM

Thank you

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